JUBILEE VOLUME

OF THE

STATISTICAL SOCIETY.

(Founded 1834.)

JUNE 22–24, 1885.

LONDON:
EDWARD STANFORD, 55, CHARING CROSS, S.W.

1885.

LONDON:
HARRISON AND SONS, PRINTERS IN ORDINARY TO HER MAJESTY,
ST. MARTIN'S LANE.

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THE JUBILEE DINNER.

Wednesday, 24th June. Third Day.

Afternoon Sitting.

INTRODUCTION.

During the forty-ninth session of the Statistical Society (1882-83), the approach of its fiftieth anniversary was taken into consideration, and a committee, consisting of Mr. Hyde Clarke, Mr. James Heywood, F.R.S., Mr. F. Hendriks, Professor Leone Levi, LL.D., Sir Rawson W. Rawson, K.C.M.G., C.B., Mr. R. Price-Williams, C.E., and the Executive Committee* was appointed "to consider in what manner the Jubilee of the "Statistical Society may be utilised for the advancement of "Statistical Science and the extension of the Statistical Society; "and also to consider whether it will be expedient to solicit the "co-operation of Her Majesty's Government with a view of "securing the attendance of foreign delegates at the same."

On the 20th February, 1884, it was resolved by the Jubilee Committee that it would be desirable to add to the Committee the names of some of the most eminent members of the Society. The necessary steps to this end having been taken, a Grand Committee was formed, consisting of the following Fellows of the Society:—

* Mr. Robert Giffen, LL.D. (President), Sir James Caird, K.C.B. (ex-President), Mr. Richard B. Martin, M.P. (Treasurer), Mr. Hammond Chubb, Mr. John B. Martin, and Mr. A. E. Bateman (Hon. Secretaries).

JUBILEE GRAND COMMITTEE.

Hon. Vice-Presidents.

The Rt. Hon. The Earl of Shaftesbury, K.G., D.C.L.
The Rt. Hon. The Earl of Derby, D.C.L., F.R.S.
William A. Guy, Esq., M.B., F.R.C.P., F.R.S.
James Heywood, Esq., M.A., F.R.S.
The Rt. Hon. G. Shaw Lefevre, M.P.
Sir Thomas Brassey, K.C.B., M.P.
Sir James Caird, K.C.B., F.R.S.

President.

Robert Giffen, LL.D.

Vice-Presidents.

Robert Lawson, LL.D.
Lionel Louis Cohen.
Sir R. W. Rawson, K.C.M.G., C.B.
Sir John Lubbock, Bart., M.P., F.R.S.

Treasurer.

Richard B. Martin, M.P.

Council.

George S. Baden-Powell, M.A., F.R.A.S., C.M.G.
T. Graham Balfour, M.D., F.R.S.
Alfred Edmund Bateman.
Stephen Bourne.
J. Oldfield Chadwick, F.R.G.S.
Hammond Chubb, B.A.
Hyde Clarke.
Major P. G. Craigie.
Sir Thomas Farrer, Bart.
Professor H. S. Foxwell, M.A.
John Glover.
Rowland Hamilton.
Alfred S. Harvey.
Frederick Hendriks.
Wynnard Hooper.
Noel A. Humphreys.
Frederick H. Janson, F.L.S.
Professor Leone Levi, LL.D., F.S.A.
John Biddulph Martin, M.A.
Francis G. P. Neison.
Evan C. Nepean.
Henry Davis Pochin, J.P.
Richard Denny Urlin.
R. Price-Williams, C.E.

Fellows.

Acland, Henry Wentworth, K.C.B., M.D., F.R.S.
Acland, The Rt. Hon. Sir Thomas Dyke, Bart., M.P.
Aldam, William, F.R.S.
Anderson, Sir James, F.R.G.S., F.G.S.
Balfour, Arthur James, M.P.
Balfour, General Sir George, K.C.B., M.P., D.L.
Balfour, Jabez Spencer, M.P.
Baxter, Robert.
Beauchamp, The Rt. Hon. Earl.
Bell, Sir Isaac Lowthian, Bart., J.P.
Bevan, G. Phillips.
Barlow, William Henry, F.R.S.
Burdett, H. C.
Caine, William S., M.P.
Campbell, Sir George, K.C.S.I.
Causton, Richard Knight, M.P.
Chadwick, Edwin, C.B.

Chamberlain, The Rt. Hon. Joseph, M.P.
Collins, Eugene, M.P.
Colomb, Captain J.P.
Corbett, John, M.P.
Courtney, Leonard Henry, M.A., M.P.
Dalyell, The Hon. Robert Anstruther, C.S.I.
Danvers, Juland.
De Keyser, Alderman P.
Du Bois de Ferrieres, The Baron, M.P., J.P.
Dilke, Sir Charles W., Bart., M.P., LL.M.
Dun, John.
Ellis, Alderman Sir John Whittaker, Bart.
Finch, George Henry, M.P.
Fortescue, The Rt. Hon. Earl.
Fowler, Alderman Sir Robert N., Bart., M.P.
Freeland, Humphrey W., J.P.
Fitzmaurice, Lord Edmond, M.P.
Fordham, E. King.
Fowler, William, M.P.
Galton, Captain Douglas, R.E., C.B., F.R.S.
Grimshaw, Thomas W., M.D., M.A.
Hall, Sir John, K.C.M.G.
Hankey, Thomson.
Hastings, George W., M.P.
Hawksley, Thomas, C.E., F.R.S., &c.
Hunt, Sir Henry Arthur.
Hyde, Major-Gen. Henry, R.E.
Jackson, W. J., M.P.
Jersey, The Rt. Hon. The Earl of.
Jeans, J. S.
Kennedy, C. M., C.B.
Kimberley, The Rt. Hon. The Earl of, M.A., P.C.
King-Harman, Colonel Edward Robert, M.P.
Lawes, Sir John Bennett, Bart., LL.D., F.R.S., F.C.S.
Lea, Thomas, M.P.
Lee, Henry, M.P.
Leighton, Stanley, M.P.
Loyd, W. Jones.
Longstaff, G. B., M.A., M.B.
Lusk, Sir A., Bart., M.P.
McArthur, Alexander, M.P.
McArthur, Alderman Sir William, K.C.M.G., C.B.
Mills, Sir Charles Henry, Bart., M.P.
Mouat, Frederic J., M.D., F.R.C.S.
Mundella, The Rt. Hon. Anthony John, M.P.
Mulhall, M. G.
Morley, S., M.P.
Palgrave, Robert Harry Inglis, J.P., F.R.S.
Palmer, George, M.P.
Pease, Sir Joseph Whitwell, Bart., M.P.
Peek, Sir Henry William, Bart., M.P.
Pender, John, M.P.
Pennington, Frederick, M.P.
Pinckard, G. H., J.P., F.I.A.
Powell, Francis Sharp, F.R.G.S.
Poynting, Professor, M.A.
Puleston, John Henry, M.P.
Purdy, F.
Quain, Richard, M.D., F.R.S., F.R.C.P.
Rankin, James, M.P.
Rathbone, William, M.P.
Ravenstein, E. G., F.R.G.S.
Rosebery, The Rt. Hon. The Earl of.
Samuelson, Sir Bernhard, Bart., M.P.
Seeley, Charles, jun., M.P.
Smith, The Rt. Hon. William Henry, M.P.
Staples, Sir Nathaniel Alexander, Bart.
Strachey, Gen. Richard, R.E., C.S.I., F.R.S.
Strutt, The Hon. Frederick.
Summers, William, M.P.
Temple, Sir Richard, Bart., G.C.S.I., D.C.L., &c.
Tritton, J. Herbert.
Welby, Sir Reginald Earle, K.C.B.
Wyatt-Edgell, The Rev. Edgell.

A meeting of the Grand Committee took place at the Society's rooms on 9th May, 1884, when Sir Richard Temple, Bart., K.C.S.I., moved, Mr. Hyde Clarke seconded, and it was carried unanimously, that a sub-committee should be appointed

to settle the time and form of the celebration of the Jubilee, viz. :—

Mr. Hyde Clarke.
Mr. Frederick Hendriks.
Mr. James Heywood, F.R.S.
Professor Leone Levi, LL.D.
Dr. J. F. Mouat, F.R.C.S.
Mr. F. G. P. Neison.
Sir Rawson W. Rawson, K.C.M.G., C.B.
Mr. R. Price-Williams, C.E.
And the Executive Committee, viz.—
R. Giffen, Esq., LL.D. (President).
Sir James Caird, C.B. (ex-President).
Mr. R. B. Martin, M.P. (Treasurer).
Mr. Hammond Chubb.
Mr. John B. Martin.
Mr. A. E. Bateman (Hon. Secretaries).

It was also resolved that Dr. Mouat be requested to prepare a memorandum for the consideration of the sub-committee.

The sub-committee accordingly met on 16th May, when a memorandum prepared by Dr. Mouat was discussed, and with some slight modifications, was adopted for recommendation to the Council, viz. :—

1. That the Jubilee be postponed until 1885.
2. That the time of the meeting be some time in June.
3. That the form of the Celebration be a Congress, extending over at least two days, to discuss questions promoting the advancement of Statistical Science. (To be held in London.)
4. That the method of discussion be settled hereafter.
5. That Four Subjects shall be submitted for discussion—two each day—to include a proposal to establish an International Statistical Society, and the uniformity of Statistics.
6. That the Council be recommended to invite H.R.H. the Prince of Wales to preside.
7. That the use of the Theatre of the London University be obtained for the occasion.
8. That official recognition should be obtained in some practical form.
9. That the aid of the Foreign Office be requested in ascertaining, through the Embassies of the foreign countries, the views of all foreign statists who may be consulted or invited.
10. That a guarantee fund be established, if deemed necessary.

The above resolutions were reported to the Council on 26th June, and were in substance adopted, the scope of the Jubilee celebration being however more closely defined as follows :—

The object of the conference (this term being substituted for that of "congress") will more particularly be :—

1. To review the work of the Statistical Society during the past fifty years.

2. To consider what has been achieved by the International Statistical Congresses, or by other means, in the direction of uniformity of statistics, and by what means that object may be further promoted.

3. To consider the possibility of establishing an International Statistical Association.

In pursuance of the above resolutions of the Committee, the following letter was addressed to the Foreign Office:—

"STATISTICAL SOCIETY, LONDON,
"*25th November*, 1884.

"SIR,—I have the honour to acknowledge the receipt of your "letter of the 15th July last, and to enclose a schedule of the "countries and names of heads of departments (that the Board of "Trade are reported to us to be in correspondence with on statis-"tical subjects) with whom this Society would wish to be placed "in communication on the subject of its proposed Jubilee Cele-"bration in June next.

"The Committee will esteem it a great favour if Lord Granville "will, in accordance with his courteous offer, communicate to the "above Statistical Departments and other Public Bodies in their "respective Countries, through Her Majesty's Representatives, the "intended celebration of the Society's Jubilee, and the special "objects of the Conference, as set forth in our Honorary Secretary's "letter of the 10th July last.

"I have the honour to be, Sir,
"Your obedient servant,
(Signed) "JOHN B. MARTIN,
"*Foreign Secretary.*

"*To the Under Secretary of State*
"*for Foreign Affairs.*"

And after some intermediate correspondence, the following letter was received:—

"FOREIGN OFFICE,
"*22nd December*, 1884.

"Sir,—I am directed by Earl Granville to transmit to you, for "the information of the Statistical Society, a copy of a circular "despatch which, in compliance with your letter of the 12th "instant, his Lordship has had pleasure in addressing to Her

" Majesty's Representatives in the countries named overleaf
" relative to the celebration of the Society's Jubilee next June.

" I am, Sir,

" Your most obedient, humble servant,

(Signed) " EDMOND FITZMAURICE.

" *The Secretary, Statistical Society,*
" 9, *Adelphi Terrace, W.C.*"

COUNTRIES.

Argentine Republic.	Egypt.	Roumania.
Austria-Hungary.	France.	Russia.
Baden.	Germany.	Saxony.
Bavaria.	Greece.	Spain.
Belgium.	Italy.	Sweden and Norway.
Brazil.	Mexico.	Switzerland.
Central America.	Netherlands.	United States.
Chili.	Peru.	Uruguay.
Columbia.	Portugal.	Würtemberg.
Denmark.		

[CIRCULAR DESPATCH.]

" FOREIGN OFFICE,
" 22*nd December*, 1884.

" I have to inform you that the Statistical Society, one of the " leading Literary and Scientific bodies in London, intend to " celebrate the Jubilee of the foundation of the Society in June, " 1885. The object of the meetings to be then held will be more " particularly :—

" 1. To review the work of the Society, and of similar bodies " in foreign countries, during the past fifty years;

" 2. To consider what has been achieved by the International " Statistical Congresses, or by other means, in the direction of the " uniformity of statistics, and by what measures that object may " be further promoted;

" 3. To consider the possibility of establishing an International " Statistical Association.

" In view of the high character of the Statistical Society, and " of the importance of the subject to which its aims are directed, I " have consented that Her Majesty's Representatives in countries " in which communications are made to the Society by Public " Departments should make known, unofficially, to the Govern- " ments to which they are accredited, the intended celebration of " the Society's Jubilee, and the objects of the meeting, for the " purpose of facilitating the attendance of representatives of their " Statistical Departments, and of persons engaged in the study of " statistics.

"I have accordingly to request that you will address, unofficially, "a note in this sense to the Government to which you are accredited, "and that you will ask that this intelligence may be conveyed to "departments and persons interested; and that you will further "suggest that communications should be made direct by them to "the Secretary of the Statistical Society, at No. 9, Adelphi Terrace, "Strand, London.

"I am, with great truth,

"Most obedient humble servant,
"(For Earl Granville),
(Signed) "Edmond Fitzmaurice."

The Society is much indebted to Her Majesty's Foreign Office for its courteous co-operation in thus making known abroad the aim and intentions of the Jubilee meeting.

After communications with the Statistical Society of Paris, of whose intention to celebrate in the same month the twenty-fifth anniversary of the foundation of their Society the Council had been made aware, the Jubilee meeting was fixed for 22nd and 23rd June, 1885.

During 1885 the Jubilee Committee met thirteen times, or, on an average, once a fortnight, to consider details; and small sectional committees were appointed to make the necessary arrangements for each item in the programme as finally adopted. This ultimately took the following shape:—

Programme of Jubilee Meeting, 1885.

First Day, Monday, 22nd June.

11.30 A.M. Lord Granville, Her Majesty's Secretary of State for Foreign Affairs, will receive the Officers of the Society and the Foreign Visitors at his private residence.

1 P.M. The Lord Mayor will entertain the Council and the Foreign Visitors at luncheon at the Mansion House.

3 P.M. The Jubilee meeting will be held in the Theatre of the London University, Burlington House.

President's Address.

Papers to be read:—

1. History of the Statistical Society. By F. J. Mouat, M.D.

2. Statistical Developments, with special reference to Statistics as a Science. By Wm. A. Guy, M.B., F.R.S., &c.
3. La Statistique et ses ennemis. By A. de Foville, *Vice-President Statistical Society of Paris.*

Discussion.

6 P.M. Adjournment.

7 P.M. The Council will entertain the Foreign Visitors at dinner at the Albert Palace, Battersea Park.

Second Day, Tuesday, 23rd June.

11 A.M. Papers to be read :—

1. Some general uses of Statistical Knowledge. By R. Giffen, LL.D.
2. On Uniformity of Statistics. By J. S. Jeans.
3. On the Unification of Census Record Tables. By J. Körösi, *Director of the Statistical Bureau, Buda Pesth.*
4. On a Common Error in Statistics. By Francis Galton, F.R.S.
5. Other Papers on the same or kindred subjects.

Discussion.

1.30 P.M. Adjournment.

2.30 P.M. Annual Anniversary Meeting of the Society.

3 P.M. Papers to be read :—

1. On the Numerical Method of Statistics. By F. Y. Edgeworth, M.A.
2. On the Graphic Method of Statistics. By E. Levasseur. *Member of the Institute of France, Hon. Mem. S. S.*
3. On the Graphic Method of Statistics. By Professor A. Marshall.

Discussion.

6 P.M. Adjournment.

7 P.M. Jubilee Dinner of the Society, at the Criterion, Piccadilly.

Third Day, Wednesday, 24th June.

11 A.M. Papers to be read :—

Résumé of the results of the International Statistical Congresses, and Sketch of proposed form of an International Statistical Association. By Professor von Neumann-Spallart, *Member of the Imp. Stat. Commission, Hon. Mem. S. S.*

Discussion.

1.30 P.M. Adjournment.

3 P.M. Renewal of Discussion, and any historical or suggestive papers on above subject.

6 P.M. Adjournment.

9 P.M. Jubilee Conversazione at the South Kensington Museum.

In the end the sub-committee were enabled, by the co-operation of the Foreign Office and the principal foreign Governments, to secure the attendance of representatives from most of the principal foreign countries, in many cases directly delegated by their respective Governments, as follows :—

Statistical Society's Jubilee. List of Visitors. June, 1885.

Number.	Country.	Name.	Title or Office, and Capacity in which attending.
1	Austria-Hungary	Von Inama-Sternegg, Dr. K. T.	President of the Imperial and Royal Statistical Central Commission. Delegated by the Government.
2	,, ...	Keleti, Charles	Chief of the Royal Hungarian Statistical Bureau, Imperial and Royal Counsellor, &c. Delegated by the Government.
3	,, ...	Hunfalvy, Dr. Jean.....	Do.
4	,, ...	Von Neumann-Spallart, Professor F. X.	Professor of Statistics and Political Economy at the University and the Agricultural College of Vienna, Member of the Imperial Central Statistical Commission. Hon. Member of Stat. Soc. Delegated by the Government.
5	,, ...	Körösi, Joseph	Director of Local Statistical Bureau, Member of the Hungarian Academy of Sciences, &c. Delegated by the City of Budapest.
6	,, ...	Erben, Professor	Director of Statistical Bureau of the Commune of Prague. Delegated by the City of Prague.
7	Belgium	Liagre, General J.	President of Central Commission of Statistics, Perpetual Secretary of the Academy. Delegated by the Government.
8	Brazil	De Penedo, H. E. Baron	Brazilian Minister in London. Delegated by the Government.
9	France.....	De Foville, Alfred	Chief of Statistical Bureau, Ministry of Finance: Secretary of Superior Council of Statistics, &c., Vice-President, Statistical Society of Paris, &c. Delegated by Minister of Finance.
10	,, ...	Levasseur, Emile	Member of the Institute, Professor at the College of France, &c. Hon. Member of Stat. Soc. Delegated by Ministers of Commerce and of Public Instruction.
11	,, ...	Loua, Toussaint	Secretary of Statistical Society of Paris, Chief of the General Statistical Bureau of France, &c. Delegated by Minister of Public Instruction.
12	,, ...	Bertillon, Dr. Jacques....	Chief of Statistical Bureau of City of Paris, Director of the "Annales de Démographie." Hon. Member of Stat. Soc. Delegated by the City of Paris.
13	,, ...	Bourgeois, Léon	General Secretary of the "Prefecture of the Seine." Delegated by the City of Paris.
14	,, ...	Chervin, Dr. Arthur.....	Member of Statistical Commission of City of Paris, Director of the "Institution des Bègues de Paris." Hon. Member of Stat. Soc. Delegated by the City of Paris.
15	,, ...	Bonaparte, le Prince Roland	Member of Statistical Society of Paris. Invited.
16	,, ...	Hennequin, F.	Officer of Public Instruction. Invited.
17	,, ...	Juglar, Clement	Past President Statistical Society of Paris. Hon. Member of Stat. Soc.
18	,, ...	Liegéard, A.	Ministry of Commerce. Invited.
19	,, ...	De Malarce, A.....	Secretary of the "Société des Institutions de Prevoyance." Invited.
20	,, ...	Robÿns, Jules	Treasurer of Statistical Society of Paris, Officer of Public Instruction, &c. Invited.

Statistical Society's Jubilee. List of Visitors—Contd.

Number.	Country.	Name.	Title or Office, and Capacity in which attending.
21	Greece	Argyropoulos, G. A.	Greek Chargé d'Affaires in London. Delegated by the Government.
22	Holland	Verschuer, Baron von	Director of the Statistical Society of the Netherlands. Delegated by the Government.
23	Italy	Bodio, Luigi	Director General of Statistical Department. Hon. Member of Stat. Soc. Delegated by the Government.
24	„	Perozzo, Luigi	Inspector of Ministry of Finance.
25	Norway	Kiaer, A. N.	Director of the Statistical Bureau of Norway. Hon. Member of Stat. Soc. Delegated by the Government.
26	Roumania	Prince Jon Ghica	Roumanian Minister in London.
27	Russia	Boutourline, Col. S. de	Military Attaché to Russian Embassy in London. Delegated by the Government.
28	„	Kaufmann, H.	Chief Recorder of the Central Statistical Commission. Deputy Comptroller-General of the Railways Section of the Imperial Control. Delegated by the Government.
29	„	Troinitsky, Nicholas	Director of the Central Statistical Commission Ministry of the Interior. Delegated by the Government.
30	United States	Walker, Francis A.	Ph.D., LL.D., President of American Statistical Association. Hon. Member of Stat. Soc. Invited.
31		Barron, Sir Henry, Bart.	Minister Resident, Stuttgart. Hon. Member of Stat. Soc.
32		Montgomery, Robert	President of Manchester Statistical Society. Hon. Member of Stat. Soc.
33		McDonnell, James	President of Statistical and Social Inquiry Society of Ireland. Hon. Member of Stat. Soc.

The Statistical Society of Paris, by adjourning the celebration of their twenty-fifth anniversary from 5th June, the date originally fixed, to the 15th—19th, made it the more easy for the foreign visitors to attend both celebrations.

By the courtesy of the Senate of the London University, their theatre in Burlington Gardens was placed at the disposal of the Statistical Society for their business meetings, while the reception of the delegates by Her Majesty's Secretary of State for Foreign Affairs, Earl Granville, and their entertainment at luncheon by the Lord Mayor, were courtesies very much appreciated. The Councils of the Royal Botanic Society, the Zoological Society of London, and the Exhibition of Inventions, kindly gave to the foreign visitors the *entrée* of their grounds.

The Committee had only to regret that owing to other engagements, H.R.H. the Prince of Wales, the Honorary President of the Society, was unable to be present at the meeting.

RECEPTION BY EARL GRANVILLE.

Monday, 22nd June, *First Day.*

Her Majesty's Secretary of State for Foreign Affairs, Earl Granville, unofficially received the Officers of the Society and their Foreign Visitors at his private residence, Carlton House Terrace, at 11.30 a.m. After the introduction of the Visitors, Lord Granville briefly expressed the pleasure which he felt in meeting them, and subsequently introduced the party to Lady Granville.

LUNCHEON AT THE MANSION HOUSE.

Monday, 22nd June, *First Day.*

The Right Hon. the Lord Mayor, Mr. Alderman R. N. Fowler, M.P., entertained the Officers and Council of the Society, and their Foreign Visitors, to the number in all of about sixty-five, at luncheon at the Mansion House. After proposing the health of Her Majesty the Queen, the Lord Mayor proposed that of the Foreign Visitors, to which Sir Rawson W. Rawson, Mons. Levasseur (France), Mons. Troinitsky (Russia), and General Walker (United States of America), replied. The health of the Lord Mayor was then proposed by the Right Hon. J. G. Shaw-Lefevre (Her Majesty's Postmaster-General), and Lord Mayor having replied, the company separated.

ILLUSTRATIONS AND DIAGRAMS.

JUBILEE MEETING

OF THE

STATISTICAL SOCIETY,

Held in the Theatre of the University of London, Burlington Gardens.

Sir Rawson W. Rawson, K.C.M.G., C.B., President, took the Chair at 3 p.m.

The President said that his first and one of his most pleasant duties was to welcome the Fellows of the Statistical Society of England and their foreign friends who were present. He should scarcely have time to introduce all their foreign friends, but he would read a list of those who were present, and the names of the countries which they represented; which would show to what extent sympathy had been exhibited on the part of foreign Governments in connection with the Society, and how admirably those Governments were represented by the gentlemen whom they had delegated. He would read them in the order in which they stood in the printed list prepared by the Committee for the convenience of the Fellows and their Visitors.*

As some time had elapsed since there had been a general meeting of the Society, as many members had had no opportunity of becoming acquainted with the Officers of the Society, and as during the week there would be frequent opportunities of friendly intercourse and discussion of matters of interest, he begged to be allowed to introduce the Officers of the Society who were present: Dr. Graham Balfour, Mr. Stephen Bourne, Mr. Hyde Clarke (Vice-Presidents). Mr. Hammond Chubb, the fourth Vice-President, was detained in Scotland by family circumstances. Mr. John Biddulph Martin, Foreign and Honorary Secretary, Mr. Bateman, Honorary Secretary.†

* For this list see Introduction, pp. xiii and xiv.

† Mr. George Baden-Powell, the third Honorary Secretary, was absent from England.

ADDRESS *of the* PRESIDENT, SIR RAWSON W. RAWSON, K.C.M.G., C.B., *at the* OPENING *of the* JUBILEE MEETING *of the* SOCIETY, *Monday*, 22*nd June*, 1885.

THERE are certain epochs in the life of a Society, as in that of man, which few of its associates can expect to signalize more than once in their lifetime. Such is the Jubilee of this Society which we are met to celebrate.

The Council has therefore, I doubt not, justly interpreted the general wish of the Fellows of the Society, that they should be called together to unite in the commemoration of the event, and that their fellow workers in other countries, distinguished for their important and successful labours in the same field of science, should be invited to join them in doing honour to the founders of the Society, and in signifying their sympathy with its operations, and their appreciation of the success which it has achieved.

In communicating this invitation to our foreign colleagues, the Council has reason gratefully to acknowledge the assistance and favour which it has received from Earl Granville, Her Majesty's Secretary of State for Foreign Affairs, who, by a circular to the British representatives in the principal countries in Europe and elsewhere, has made known to the Governments of those countries the wish of the Council that they should be largely represented upon the present occasion, and his desire to mark his own estimation of the position and character of the Society.

It is well known to our own Fellows that the Society, like the majority of similar bodies existing in this country, was founded, and has been maintained, independent of any official recognition or support. It is true that the Government has on many occasions acknowledged its usefulness, and adopted its recommendations; though it has been a subject of regret to successive Councils that the Government has not found an opportunity of so far aiding it as to provide a suitable habitation for it in one of the public buildings.

But the language of Earl Granville is so significant in its approbation of the Society and its objects, and its enunciation in England, as well as to the Governments of foreign countries, cannot fail to be so satisfactory to our assembled Fellows, that I will here quote it:—

"I have to inform you that the Statistical Society, one of the

"leading literary and scientific bodies in London, intend to cele-
"brate the Jubilee of the foundation of the Society in June, 1885."

After describing the proposed objects of the meeting, his Lordship continues:—

"In view of the high character of the Statistical Society, and
"of the importance of the subject to which its aims are directed,
"I have consented that Her Majesty's representatives in countries
"in which communications are made to the Society by public
"departments should make known, unofficially, to the Govern-
"ments to which they are accredited, the intended celebration of
"the Society's Jubilee, and the objects of the meeting, for the
"purpose of facilitating the attendance of representatives of their
"statistical departments, and of persons engaged in the study of
"statistics."

The Council would also desire to acknowledge the very gratifying reception which foreign Governments have given to their invitation, by delegating and giving facilities to so large a body of distinguished public officers to attend and take a part in the proceedings of the meeting, affording thus the strongest evidence of their continued desire to promote uniformity in the collection and publication of national Statistics.

Before proceeding further, I must advert to the fact that this year is not strictly the jubilee, or fiftieth anniversary, of the formation of the Society, which was founded in March, 1834. But the lamented death of H.R.H. The Duke of Albany in the spring of last year compelled the Council to postpone its celebration to the present year.

It has thus fallen to my lot to welcome you, and to preside over your proceedings on this occasion. If in such a case it is allowable to introduce a personal topic, I would fain mention that the present year is the jubilee of my own connection with the Society, that I became one of its honorary secretaries in 1836, and the first editor of its *Journal* on its publication in 1838. I therefore think, and may be permitted to say, of myself, *Quorum pars prisca fui.* My public service in the colonies afterwards separated me from active participation in the work of the Society for the third of a century. It is therefore no small matter of pride to me that the confidence of my present colleagues, confirmed by your approval, has placed me in the honourable position of your President.

But, alas! of my early contemporaries I stand almost alone. You will presently learn from Dr. Mouat, who is so well known to most of our foreign visitors, and whom we shall henceforward designate as the historian of our Society, that only four of the original members survive.

Two only of them have I the pleasure of greeting here to-day.

One is Mr. Edwin Chadwick, C.B., whose labours in the reform of the system of Poor Relief, in the origination of sanitary inquiries, and in the amelioration of the condition of the working classes in this country, have won for him a permanent niche in the Walhalla of our British Statists.

The other is Mr. James Heywood, F.R.S., whose unwearied efforts for the extension of a liberal system of education in England, and whose constant personal exertions in support of this Society deserve your grateful recognition on the present occasion.

While so few of the Conscript Fathers of the Society have been spared to us, how ruthlessly have many of the most distinguished of its Fellows been untimely cut off within the last decade! Many here to-day will miss with painful regret the once familiar faces of our late eminent colleagues, Dr. W. Farr, Mr. W. Newmarch, and Professor Stanley Jevons, and will deplore the loss of their weighty teaching, and of their valuable guidance.

Another of our most valued Fellows, who has for the last forty-five years filled the most prominent places in our Council, and has been the largest contributor to the study and application of statistical science, is also absent to-day. I refer to Dr. W. A. Guy. But I rejoice to say that he is with us in the spirit; he has taken the greatest interest in all our Jubilee arrangements, and has contributed a paper for our instruction. It is only the delicate state of his health which prevents him from taking a part in our proceedings.

Time does not permit of my recalling to your memory the conspicuous qualities and valuable labours of the distinguished series of men, eminent in statistical and political science, who have filled the office of President of your Society, nor of much further enlisting your sympathy on behalf of the many no less eminent contributors to the progress and reputation of the Society who have been taken from us. The eulogy of the former will probably find a fitting place in a bright page of the history of the Society. In the case of the latter, I cannot pass on without making two exceptions. On this anniversary I cannot omit to express the increasing sense entertained by the Council of the irreparable loss which the Society has sustained in the death of its first Honorary President, H.R.H. the late Prince Consort, who took a lively interest and an active part in the work of the Society, and whose eloquent and instructive address to the International Statistical Congress, when that body met in London in 1860, will be well remembered by many of those now present who had the privilege of hearing it.

The other name which I would recall as a guiding star in our present meeting is that of the Nestor of the international con-

gresses, the venerable Quetelet, whose expansive genius, high mathematical attainments, and sedulous application of his great powers and industry to the development of the theory and the illustration of statistical science, entitle him to the highest place among its early teachers.

The Council has been anxious that the subjects to be brought before you for your consideration and discussion should be of permanent interest, and worthy of the importance of the occasion. It has desired further to avail itself of the presence of so many distinguished foreign representatives of statistical science to examine how far the opportunity may be turned to account in promoting the improvement of the methods, and introducing greater uniformity in the collection and publication of national statistics.

You are aware that this latter object was the special aim of the many international statistical congresses, nine in number, which assembled between the years 1853 and 1876, first at Brussels and then successively at Paris, Vienna, London, Berlin, Florence, St. Petersburgh, and Buda-Pest. The transactions of these congresses have been very fully recorded, and abstracts of them have been given from time to time, notably by Herr Engel in 1863, by M. de Séménow in 1872, M. Quetelet in 1873, and M. Heuschling in 1882.

We shall be favoured on this occasion with a review of the principal results of these Congresses by Professor von Neumann-Spallart, and with his views as to the possibility of resuming them, or of attaining the same end by other means, to the consideration of which the Council has devoted the whole of the third day of this meeting.

The Council has felt that the independent and unofficial character of this Society did not entitle it to attempt at resuming the work of the Congresses, which were invested with an international and official authority; but it will be disappointed if the friendly meeting of so many eminent statisticians from a number of countries, some of whom took a part in the Congresses, and who will be in a position to discuss from an unofficial point of view the means of approximating more closely to the desired uniformity, will not lead to useful results in that direction.

The subject has already been broached at the recent Silver Jubilee of the Statistical Society of Paris, at which I had the high gratification of being present last week, with the double object of manifesting the interest which this Society feels in the labours and successes of our sister Institution, and of profiting by the varied and very interesting addresses and papers presented on that occasion. I am glad to have the opportunity of thanking the illustrious President, M. Leon Say, and the other officers of

that Society, for the most friendly reception which they gave to this Society in the person of its representative.

Our programme differs somewhat from that of the Statistical Society of Paris in the character of its papers, as the Council has judged it desirable that during the short time available for examining and discussing statistical questions, we should confine ourselves as much as possible to the history, theory, and methods of statistics, and to the means of introducing greater uniformity in their exposition by international agreement.

This limitation of time, which was absolutely necessary at this busy season of the year, imposes on me the duty of not trenching too long upon your attention. The topics upon which, if I had more time at my command, I should naturally address you, will be more fully and more ably brought before you by those who will follow me; but there are one or two points which have not been included in the printed programme, and upon which I desire to say a few words.

I would suggest that the present would be a favourable occasion for settling, if possible, the vexed question of the legitimate claim of Statistics to be acknowledged as a science, and to come to an agreement as to its definition and limits.

The question has been frequently discussed at the meetings of the international Congresses. It has been the subject of examination by a large number of scientific writers on the continent, and by a smaller number in our own country. The *Journal* of this Society contains in several of its recent numbers a very full description of the latest views expressed with regard to it. In 1865 Dr. Guy presented a paper on the original and acquired meaning of the term "Statistics," and on the question whether there be a science of statistics; and, if so, what are its nature and objects, and what is its relation to political economy and social science. He came to the conclusion that there is a science of statistics, a science according to the definitions of Sir J. Herschel and Professor Sedgwick. The former describes science as "the knowledge of many, orderly and methodically digested and "arranged, so as to be attainable by one;" and the latter as the result "of the consideration of subjects, whether of a pure or "mixed nature, capable of being reduced to measurement and "calculation." It agrees also with the ordinary definition of a science, "a collection of the general principles or leading truths "relating to any subject, arranged in systematic order."

The subject was not again brought before the Society until 1881, when Mr. Wynnard Hooper discussed the "method of "Statistical Analysis," in a very able paper, in which he reviewed and compared the opinions of Dr. George Mayr, Engel, Haus-

hofer, Block, and Dr. Gabaglio, and came to the conclusion that there is no "science of Statistics" in the sense in which it is used by the continental writers; and only admitted that there is "a method of statistical analysis," which is applicable to various physical sciences, and is absolutely essential to Sociology. Mr. Hooper has made another valuable contribution to our knowledge of this subject by providing for the *Journal* in 1883 an abridged translation of Mayr's work on the "Theory and Practice of "Statistics;" and the literature of the subject is completed by a translation, also in the *Journal* of 1883, of a work by Dr. V. John, Professor of the University of Berne, entitled "The Term "Statistik, an Etymologico-historical Sketch," which traces the history and meaning of the word from its earliest use, as far back as 1672, and concludes with the statement that Statistics "have "become an actual science of observation in the service of social "science; it is a science with a definite aim, an orderly classifica-"tion of subjects, a numerical method with its strict rules of "synthesis and analysis, by which it is endeavoured to illustrate "by facts the conditions and prospects of society."

It appears difficult to understand how in the face of such definitions of the term science, and of such a description of the quality and functions of statistics, their claim to be accepted as a science should be challenged. Yet we have frequent evidence of such denial, or of grave doubts, on the part even of friendly advocates of their scientific study and practical application.

As recently as 1878 Professor Ingram, in his presidential Address to the section of Economic Science and Statistics at the meeting of the British Association in Dublin, expressed his opinion that "it was impossible to vindicate for statistics the "character of a science;" although at the same time he repudiated the doctrine of Professor Bonamy Price, who in a recent work not only denied a scientific character to economic science, but maintained that the scientific method applied to it was a mistake, and was in favour of relegating the study of economic phenomena to the "common sense" of practical men, or, as Professor Ingram not incorrectly described it, to "the domain of empiricism."

Professor Ingram objected justly to the separation of economic science from statistics in the title of the section of the British Association, and considered that the two should be united under the term of social science, or as he would prefer, that of Sociology. But are not both these terms synonymous with, or rather comprehended in, the older term "Statistik," as employed by Achenwall as far back as 1749, the scope of which he defines as embracing the whole realm of social science, viz., Staatskunde, or the description of what a State is; Staatsgeschichte, or the description of what it

has been; and Staatslere (so written at that date), or the discussion of what it ought to be? It is now maintained, and not incorrectly, that the meaning of the word "statistic" has changed greatly since Achenwall's time, and even since Quetelet's early definition of it, "The representation of a State at a given point of time." Doubtless because the study of the knowledge of the facts and relations of human society, which are discussed to-day under the name of social science, were unknown to and undreamt of, by Achenwall. His detailed descriptions which show what he meant by statistics, leave no reason to doubt that strictly "social "statistics" were omitted because he had no knowledge of them. So certainly it cannot be supposed that Quetelet's conception of a State, as the field of statistical inquiry, was confined to the relations of a people to their rulers. It is only of late years that the life of the people has entered into the domain of history, which formerly consisted mainly, if not exclusively, of the acts, policies, characteristics, and personal delineation of their rulers and administrators, and the national events to which they have given rise.

Why then, I would ask, should Statistics surrender to its own offspring the position and authority to which it is entitled both by priority and superiority of method?

It has contributed not a little to the popular misapprehension of the meaning and scope of Statistics, as has been remarked by Dr. Guy and others, that in England we have adopted the plural form of the name for the science, corresponding to mathematics or mechanics, and that the name in its early use was more generally applied to the art, or method, employed in the investigation of social and economic questions, and to the results obtained by such method, rather than to the science with which it is connected.

To me it appears that Statistics, or statistical science, is as well entitled to the designation of a science as astronomy, geology, or botany. As these are severally defined to be the science which teaches the knowledge of the heavenly bodies, or which treats of the structure and composition of the earth, or which treats of the structure and life of plants, so I would suggest that statistics may be defined as "the science which treats of the structure of "human society," *i.e.*, of society in all its constituents, however minute, and in all its relations, however complex; embracing alike the highest phenomena of education, crime, and commerce, and the so-called "statistics" of pin-making and London dust bins.

The latest definition which I have seen of statistics corresponds very closely with this. The French Minister of Commerce, M. Rouvier, in addressing the President of the Republic upon the subject of constituting a Superior Council of Statistics, defines them as "the science of social facts expressed by numerical

"terms;" "*la science des faits sociaux exprimée par des termes* "*numériques.*" But is there sufficient reason for thus circumscribing the limits of the science? It certainly was not the conception of Achenwall. "Staatskunde," "Staatsgeschichte," and "Staatslehre" imply much more than numerical statements or tabular illustrations. I am not prepared to make statistics the handmaid of social science, to degrade the parent into the position of a hewer of wood and a drawer of water in the service of its own offspring.

It is not difficult to discern how this limited interpretation has been imposed upon Statistics. Inasmuch as the structure of human society can only be investigated adequately, efficiently, and, so to speak, mathematically, by means of aggregates of individual phenomena, or as Mayr describes them, "the quantitative obser-"vation of aggregates," as soon as this method of investigation was applied to social questions it acquired the name of statistical, and the result of investigations so conducted acquired the name of statistics.

Thus there has arisen an art, or method, of statistics, as well as a science of statistics, and although the method can lay no claim to originality or exclusiveness, for the construction and employment of aggregates, of means and averages, must be as old at least as any physical science, yet as a method applied to the investigation of the structure of human society, it has been established as an art, and has acquired a distinctive name, as the correlative of statistical science. It seems a misnomer to apply the term to physical sciences which have no relation to any of the meanings which enter into, or have been attributed to, the name of statistics.

In the same way that Arithmetic is both the science of numbers and the art of numbering, so it may be maintained that Statistics, or if it were allowable to use the corresponding singular number, Statistic, is the science of human society in all its relations, and the art of measuring it and all its component parts on mathematical principles; dealing not with speculations, guesses, and simple observation, or, as Mayr calls it, unit observation, but in strict accordance with that sovereign science which treats of magnitude and number, or of whatever can be measured or numbered.

It may be said that mathematical precision of results is here unattainable; but mathematical principles of investigation are available, and, the more closely these are applied, the nearer will be the approach to mathematical precision in the results.

Thus meteorology, which deals with the subtlest and most variable elements of the universe, with the wind, of which it was once said that no one might know whence it cometh or whither it goeth; and with the clouds, concerning which it was once asked,

"who can understand the spreading of them?"—is now not only by general admission accepted as a science, but by observation and exact methods of investigation is being reduced to a system, whose laws may be defined, and whose operations may be apprehended and predicted. So it is at the present day with statistics. Day by day unexpected and trustworthy results, disclosing hidden moral truths and unlooked for social agencies, are brought to light, alike for our warning and our guidance.

There may be, and there ever will be, incorrect, unsound statistics, as there will be incomplete or unsound results and details in the domain of every science. In logic the premises may be incorrect or misstated, the reasoning may be sophistical, and the conclusions altogether false and misleading. But logic is not thereby dethroned from its high estate.

I lately heard an eminent medical professor facetiously put forward as a paradox, or rather sophism, that a high death-rate was a sign of national prosperity; because, as he argued, one-fourth of the annual deaths occur in the first year of life: therefore, if the number of deaths increased there must have been a proportionate increase in the number of births; an increase in the number of births implied an increase in the number of marriages; and an increase in the number of marriages was a proof of prosperity among the people—therefore a high death-rate is a sign of national prosperity. I need not point out the fallacies running through the proposition, as I might if it had been seriously suggested.

In claiming for Statistics a superiority of method over social science or sociology, I would point out that the latter may be studied by less precise methods than the former; and for this reason I would draw a distinction between the terms Statist and Statistician. The former may be described as one who occupies himself, and is skilled, in the science of human society; while the latter is one who pursues the study of that science by statistical methods. The former in statecraft may be represented as the pilot who steers the vessel; the latter as the maker of the compass by which the vessel is steered. The latter in fact is the man of science who supplies the material which qualifies the former to practise his art with success.

A second suggestion is that we should take advantage of the present occasion to urge upon the Government the appointment of some superior body, council or commission, to organise and unify the collection, abstraction, and publication, of the official statistics, not only of the United Kingdom but of the empire. This was the unanimous recommendation of the several international congresses, which has been carried out in several other

countries, but not as yet in England. Central statistical commissions have been created by the Government of Belgium as far back as 1841, by that of Prussia in 1860, of Austria in 1863, and of Italy in 1872. Within the present year the Government of France has created a superior Council of statistics, constituted upon the enlightened recommendations of a special commission which was appointed to prepare the scheme in May, 1884. The same hesitation has existed in France as here with regard to the department under whose authority such a body should be constituted, whether under that of the finance minister, or of the minister of commerce. The doubt has been decided in France in favour of the latter, on practical grounds, which, I hope, will have due weight here, and lead to a similar decision, if only to secure the advantage of the experience and rare ability of my eminent predecessor in this chair.

I will close with one other suggestion. Whatever may be the result of our deliberations on the subject of an international Statistical association, we should not separate without arranging for completing the work so well begun by the Statistical Society of Paris, by obtaining from each Government which is represented at this meeting a detailed report upon the organisation and publications of the several departments which publish the statistics of their operations, as well as on the constitution and working of the superior and controlling council, if any, established in each. In this respect, too, France has led the way; M. Levasseur, whom we are happy to greet here to day, has published in the last number of the "Journal of the Statistical Society of Paris" an admirable historical account of what the French Government has done towards the collection and publication of the national statistics, and a detailed statement of what each department of the Government now collects and publishes.

In connection with this, it would be desirable to have an interchange of these publications, and a public office in each country in which they should be available for consultation by the public. This is one of the proposed functions of the newly created statistical Council in France, whose duty it will be to consider the means "of organising a library of international statistics to be "established in the Ministry of Commerce." The Statistical Society has lately received from the Finance Minister of Belgium, to whom I desire thus publicly to return our thanks, a very extensive series of the official publications of that country; but it is obvious that the Society cannot offer that accommodation for the extensive and ever increasing collection of such volumes, or those conveniences for consulting them, which should be opened to the public.

In conclusion, I cannot abstain from noting the happy inspiration by which the celebration of the Jubilee of this Society, and that of the Silver Jubilee of our sister Society in Paris were fixed for the same month, and by the excellent judgment of the Council of the latter Society have been brought into successive weeks. To this circumstance I doubt not we may partly attribute the presence of so large a number of our distinguished fellow workers, and of the official Directors of the principal Statistical Departments in foreign countries, who have been thus able to take a part in both meetings.

Nor shall I fail to interpret your sentiments rightly, if, in your name, I repeat the welcome which I have already offered to those gentlemen, and express the hope that the present meeting will not only afford the opportunity of bringing the two Societies into friendly and close relationship, and of enabling the Fellows of this Society and the leading Statisticians of England to become personally acquainted with many eminent men already well known to them by their works and reputation, but may be the means of devising some practical plan of international co-operation in the collection of official Statistics, and in the promotion of Statistical Science.

Professor von Neumann-Spallart said he desired to communicate the sentiments of sympathy of the Baron de Czoernig, one of the Presidents of the Statistical Congresses, and late President of the Statistical Commission of Austria. He was very sorry not to be able to come to England, the state of his health not permitting him to take so long a journey. He assured the members that he was deeply interested in the proceedings of the meeting, and also in the formation of an International Statistical Association, as proposed by the Council.

Signor Bodio desired to express on the part of Signor Correnti and Professor Messedaglia, two of the highest representatives of Statistical Science in Italy, their regret at not being able to attend. The former, though not a professional statistician, had thrown much light on statistical problems, and placed very high the ideal of research of this kind. Professor Messedaglia, for his part, represented the most severe and austere science, uniting as he did a strict mathematical culture with the profession of economical and juridical learning.

Dr. Inama-Sternegg. The Statistical Society of London, by its unceasing labours of the last fifty years, has earned for itself the undisputed right to the title of the first and most important Society

in the world for promoting the growth of statistical knowledge, and stimulating the development of statistical operations and research. To-day, when the fiftieth anniversary of its foundation is being celebrated, the Imperial Royal Statistical Central Commission of Austria desire to express through me their appreciation of the high honour of being represented among those who enjoy the privilege of assisting at this interesting ceremony, and they take this opportunity of bearing testimony to the very valuable results that have accrued to Statistical Science generally from the untiring efforts of the Statistical Society of London. I am instructed on their behalf to express the fervent wish that the day which ends the fiftieth year of the existence of this useful and important Society, may not only witness the inauguration of a new era uniting more closely statisticians of all nationalities in the cause of statistical science, but that its sphere of usefulness may be greatly extended, and its unceasing labours in promoting and fostering the growth of statistical knowledge and research be crowned in the future with the same measure of success as has attended its efforts in the past.

Dr. F. J. Mouat read the following paper on the History of the Statistical Society.

History *of the* Statistical Society *of* London.

By Frederic J. Mouat, M.D., *late a Vice-President, Secretary, and Foreign Secretary, and Editor of the Journal of the Society, &c.*

CONTENTS:

Part I.

General Introduction. Origin and Foundation of the Statistical Society of London.

This Society originated in a suggestion of the illustrious M. Quetelet, eminent as a mathematician, an astronomer, and a statistician. It happened in this wise:—

In 1832 a Statistical Section was added to the British Association for the Advancement of Science. In the following year this Association, then in the third year of its existence, met at Cambridge and appointed a permanent committee of the section to regulate its affairs. The chairman of this committee was Mr. Babbage, the secretary Mr. Drinkwater Bethune, and among the members were Hallam the historian, Professors Malthus, Empson, and the Rev. Richard Jones, all distinguished economists, the late Sir John Lubbock, and M. Quetelet.

The inquiries of this section were restricted "to facts relating "to communities of men which are capable of being expressed by "numbers, and which promise when sufficiently multiplied to "indicate general laws."

M. Quetelet, who was already distinguished as a mathematician and a statist, considered this to be too limited a view of the functions and objects of statistical inquiry, a subject on which he was even at that early period an acknowledged authority. He accordingly suggested to Mr. Babbage, from whom we have the statement, the formation of a Statistical Society in London.

The institution of the Statistical Section of the British Association was itself regarded with so much misgiving by some of the members, who considered it to be foreign to its proper purposes, as to necessitate a limitation of the specific objects of inquiry, and to need something in the shape of an apologetic explanation from the President of the year, the learned Professor Whewell, the famous Master of Trinity. He explained what he considered to constitute science, and what the proper object of the Association, which was deemed to be for the promotion of natural science. By science he understood the consideration of all subjects, whether of a pure or mixed nature, capable of being reduced to measurement and calculation. "All things," he continued, "comprehended "under the categories of space, time, and number properly belong "to our investigations; and all phenomena capable of being "brought under the semblance of a law are legitimate objects of "our inquiries. But there are many important subjects of human "contemplation which come under none of these heads, being "separated from them by new elements, for they bear upon the "passions, affections, and feelings of our nature . . . , they enter "not among the objects of the Association. The sciences of "morals and politics are elevated far above the speculations of "our philosophy.

"Can these statistical inquiries be made compatible with our "objects, and taken into the bosom of our Society? I think they "unquestionably may, so far as they have to do with matters of

"fact, with mere abstractions, and with numerical results. Con-
"sidered in that light they give what may be called the raw
"material to political economy and political philosophy; and by
"their help the lasting foundations of those sciences may be
"perhaps ultimately laid."

He deprecated strongly carrying them to their logical results where they touch the mainsprings of passion and feeling, lest it should open a door of communication with the dreary world of politics, and admit the "foul dæmon of discord" into the "Eden
"of philosophy."

Such a view of the limits and functions of statistics was not accepted by Quetelet, nor is it now admitted by any student of science, outside the pale of the devotees of natural science; but although a dissent from it probably led to the establishment of our Society, the shadow of this imaginary dæmon continued for some years to haunt its founders and to fetter its action.

Be that as it may, a public meeting was held in London on the 15th March, 1834, when the Statistical Society, of which we are celebrating the Jubilee, was founded.

The Society started with an entry of more than three hundred names, and the organising Committee immediately published a prospectus of its objects and plan, which were defined to be: to procure, arrange, and publish "facts calculated to illustrate the
"condition and prospects of society."

The first and most essential rule of its conduct was to exorcise the dæmon of Whewell by anticipation, by closing the door to all opinions from its transactions and publications, restricting its attention rigorously to facts, and as far as possible to facts which could be stated numerically and arranged in tables.

Following the example of the parent section of the British Association, the whole subject was divided into four great classes:—

1. Economical Statistics.
2. Political ,,
3. Medical ,,
4. Moral and Intellectual Statistics.

These were broken into subdivisions, fourteen in number, with an intimation that more would probably be required, as was soon found to be the case.

Sub-committees of the Council, which was elected at a general meeting held on the 3rd May in the same year, were appointed to consider and conduct inquiries in each of the above classes.

The names of the members of this first Council are deserving of preservation. They are:—

President.—Marquis of Lansdowne.
Treasurer.—Henry Hallam.
Secretaries.—Woronzow Greig, Charles Hope Maclean, E. Carleton Tuffnell.

Other Members.—Charles Babbage, William Burge, George D'Oyley, D.D., J. E. Drinkwater, Howard Elphinstone, Earl Fitz-William, H. Goulburn, J. H. Green, E. Halswell, F. Bisset Hawkins, M.D., Lord Jeffrey, the Rev. R. Jones, J. Shaw Lefevre, Sir Charles Lemon, the Bishop of London, Lord Overstone, then S. Jones Loyd, the Rev. T. R. Malthus, G. R. Porter, Lord Sandon, afterwards Earl of Harrowby, S. Poulett Scrope, Nassau W. Senior, John Sims, M.D., Colonel Sykes, Thomas Tooke, T. Vardon, and the Rev. W. Whewell.

Of the above, the sole survivor is Mr. E. Carleton Tuffnell, now in retirement;—one of the most able and efficient inspectors the Poor Law and Local Government Boards ever possessed.*

The Society went energetically to work. Communications were opened with various other statistical bodies, provision was made for the collection of fresh statistical information by its own agency, and by every other available aid, public and private, which could be enlisted.

The Society also considered that its usefulness would be extended by condensing, arranging, and publishing materials already existing at home and abroad, but either unpublished or published in an expensive and diffuse form, or in foreign languages. This latter purpose has not been effected from want of funds, and the consequent absence of the paid agency by which alone such work can be properly done. The miscellaneous department of the *Journal* is, however, rich in statistical material, gathered from published records of permanent interest and value.

It will now be my task to consider how far the Society has fulfilled or fallen short of the intentions of its founders; in what manner its work has been done; and the influence it has exercised on the science of statistics and on the nation, illustrated by such points in its history as throw light upon its path, and indicate the course it should pursue in the future.

The Transactions of the Society.

The transactions constitute the most important feature in the history of the Society, for they contain the permanent and detailed

* The remaining survivors of the original members are Edwin Chadwick, C.B.; James Heywood, F.R.S.; William Hodge, F.S.A.; and the Earl of Lovelace, F.R.S.

record of the work done. When taken in connection with the authority of the workers, and their position in the republic of letters, their contributions establish the claim of the Society to authoritative consideration, in proportion to their respective merits and positions in the various paths of inquiry, to which their time and abilities have been devoted. In an exhaustive history, a biographical notice of each member of distinction would of necessity and appropriately be included, and from this record would be deduced the value of their scientific labours. This would be out of place, however, in a narrative which professes only to be a review of the first half century of its life, leaving to some future celebration of an equally well marked epoch, the higher and more ambitious record referred to.

From 1834 to 1838 the published transactions of the Society were confined to a brief record of its meetings, abstracts of the most important papers read, and notices of the kindred institutions which came into existence about the same time, and of which but one has survived in England.

Journal of the Society.

In May, 1838, the *Journal* was established. Its nature, objects, and advantages were explained in a carefully written introduction. The relation of statistics to all branches of science generally was pointed out, and it was stated that "as all things on earth were "given to man for his use, and all things in creation were so "ordained as to contribute to his advantage and comfort, and as "whatever affects man individually affects also man in a state of "society, it follows that statistics enter more or less into every "branch of science, and form that part of each which immediately "connects it with human interests."

As statistical science had then been only recently cultivated in this country, it was deemed necessary to explain the meaning of the term, and the nature and objects of the science to which it referred.

It was said that it differed from political economy, which had the same end in view, "in that it neither discussed causes, nor "reasoned upon probable effects, but sought only to collect, "arrange, and compare the class of facts which can alone form the "basis of correct conclusions with respect to social and political "government," and determined that this peculiarity absolutely excluded every kind of speculation.

In this restricted view of its functions it continued to work for some years, and in order to emphasise it, the device selected for

the Society by Mr. Babbage, with the aid of an artist of eminence, was a wheatsheaf bound loosely by a band, carrying the motto "*Aliis Exterendum*," as reproduced in the margin.

This reflection of the misgivings of the Statistical Section of the British Association was tacitly and gradually departed from by several writers, including some of the founders of the Society, as restricting injuriously its usefulness, diminishing its dignity and importance unnecessarily, and misapprehending the real functions of such an institution. Hence in December, 1857, with the sanction and approval of the Council, Mr. Newmarch, then Secretary and Editor of the *Journal*, removed the motto and the loose band, and introduced the present device, the wheatsheaf, bound more tightly together by a simple ligature, leaving the future disposal of the wheat unfettered by any apothegm as to the manner of threshing it out, before its conversion into the bread of science.

Attention has already been drawn to the watchful jealousy with which the founders of the Society endeavoured to prohibit the intrusion of opinions among the facts to the collection of which they thought the Society bound to confine itself.

In the report of the Council at the Sixth Annual Meeting, it was again advanced and strongly insisted upon. The strength and force of the feeling of mistrust may be measured by the secession of Lord Overstone, one of the founders of the Society, after a brief assertion in opposition to Mr. Newmarch of the principles on which the Society had been based, and to Dr. Guy's views of the proper functions of such an Institution.

For the first twelve months, May, 1838, to April, 1839, the *Journal* appeared monthly. It was then issued quarterly, and so has continued to the present time.

The number of original papers read in each of the sections into which the work of the Society has been classified is contained in the subjoined statement. It would occupy too much space to detail them in the appendix :—

1. Economical Statistics	127	papers.
2. Political Arithmetic	42	,,
3. Vital Statistics.....	112	,,
4. Moral and Intellectual Statistics	104	,,
5. Miscellaneous Statistics	103	,, *

As the Society meets once a month during each session, and but one paper is usually read at each meeting, this gives an annual average of nearly ten original papers: a few abstracts of works and papers of merit were also read which are not included in the above, as they did not consist of original matter. A vast amount of statistical information has also been accumulated under the head of Miscellanea, an important section of the *Journal.* Of these by no means the least useful and important have been the quarterly returns containing condensed summaries of many of the monthly official tables relating to imports, exports, shipping, bullion, poor relief, the registration returns of the United Kingdom, meteorological and agricultural statistics, and other matters of general and permanent interest. It was originally my intention to have prepared an analytical abstract of the subjects discussed, and of the papers read in the various branches of statistical inquiry above referred to. But I have been compelled, much to my regret, to abandon the design. I found the field to be traversed to be so extended that it would occupy much more time than I had to bestow upon it, and the material to be condensed to be so abundant and closely reasoned, as to demand far more space than could be assigned to it.

I hope, however, that it will yet be done. Nothing would more completely prove how faithfully the Society has carried out the intentions of its founders; how thorough its work has been, and how high is the position it is entitled to occupy in relation to those branches of science which conduce most directly to the well being and happiness of man, individually and collectively.

The Royal Society took up the subject of political arithmetic in a restricted sense many years ago, but of 4,166 papers read and recorded in its transactions from 1622 to 1800, but 39 were devoted to that limited branch of statistics. These papers related chiefly to

* In this are included ten papers by Dr. Guy on Statistical Methods, and five others by Neison, sen., Messrs. Baily, Newmarch, Hooper, and John.

the numbers of the population of certain places, and some of them touched upon the censuses of the population. One of the historians of the Royal Society stated that the subject might without impropriety have been discussed under the head of mathematics, but it was left out partly because mathematics was too much crowded, and in part because some of the most curious of the papers had not taken a mathematical view of the subject, and were more or less ingenious speculations.

The doctrine of annuities founded on the probabilities of human life was designedly excluded, because it was deemed a doctrine purely mathematical, depending upon the theory of compound interest, and therefore out of place in such a Society.

Since the commencement of the present century the papers on political arithmetic have been fewer still, and with a very few exceptions are of moderate merit and seldom referred to.

The Economic and Statistical Section of the British Association, the parent and precursor of our Society, has done much good work, the better part of which has however been performed by our most active members. A disposition has been shown to suppress this section, but as yet without success. The old spirit of the Royal Society, of which it may be regarded as the popular and ambulatory representative, would seem still to animate it in its antiquated and obsolete views on the subject.

The annual addresses of the Presidents of this section, many of them of considerable interest, enrich the pages of our *Journal.*

The corresponding section of the Social Science Organisation has taken up wisely and well some important branches of statistics in their relation to Sociology. It has assisted successfully in popularising and extending the taste for such pursuits, a service of no mean order in this age of progress and the general diffusion of education. The addresses of the Presidents of this section have also found a place in our *Journal.*

But none of the above have taken the place, or exerted the influence of this and other statistical societies on the science itself, or on the legislation which is based upon it.

The chief attention of the Society has, as might have been expected, been directed to social, economical, moral, and vital statistics, more than to inquiries on statistical methods and the philosophy of the science itself. These, however, have not been neglected.

A brief review of the nature and extent of the information contained in the contributions to the more prominent sections of statistics will not be without interest, beginning with probably the most important of them all, the periodical numbering of the people.

As types I have selected the censuses, poverty, pauperism,

and the poor laws, crime and criminals, education, postal, railway and steam communication, taxation, vital statistics, banks and banking, and the representation of the people.

Censuses.

In every decennial enumeration of the people of the United Kingdom since its institution, the Statistical Society has taken an active and useful part.

In 1840 a Committee of the Council was appointed to consider the best mode of taking the census of 1841, and the "points" most desirable to include in the inquiry. A very careful study of the systems adopted in every civilised country, with an examination of the former enumerations in this country, their defects and shortcomings, was submitted to the Council, and valuable suggestions were made for their improvement. These were transmitted to the Government by the Council, and led to the withdrawal of a Bill in which the imperfect system and obsolete machinery of the past had been continued, and a new Bill was introduced and passed, embodying the principal recommendations of the Committee above referred to.

Another committee was appointed in 1850, which suggested further improvements and additions in the taking of the census of 1851, which were favourably received. In the census of 1861 further recommendations were suggested regarding religious persuasions; the increase of charitable and beneficent societies; agricultural statistics; the character as well as the number of the dwellings of the population; details of each age under five, and improvements on the censuses of Great Britain and Ireland. A summary of this census when taken, is contained in the twenty-second volume of the Society's *Journal.*

In the census of 1871 suggestions were again submitted by the Society, drawing attention to the recommendations not adopted in 1861, as to the provisions existing for religious worship, and the means of education, with the attendance of pupils; proposing also that inquiries to show the state of the house accommodation of the people on the basis successfully introduced in Scotland, should be adopted in England.

A valuable paper on the population statistics of England by Mr. T. A. Welton is contained in the thirty-second volume of the *Journal;* and one of great interest on the house accommodation of England and Wales, with special reference to the census of 1871, is contained in the same volume.

A memorial from the British Association was also presented to the Government, urging the great importance of uniformity in the census of 1871.

In 1879 the last committee on the subject was appointed to consider "whether any suggestions can with advantage be made as "regards improvements in the inquiry or machinery connected "with the census of 1881."

Its chief recommendations were to secure a general report on the whole kingdom, uniform in material and substance; that the census should be quinquennial; that it should contain an industrial census; and that all public departments should furnish detailed returns of matters connected with their actual administrations.

The details of the recommendations, which were submitted to the Home Department, are contained in the forty-third volume of the *Journal.* Our present President was chairman of this committee. A summary of this census is among the Miscellanea of volume forty-four of the *Journal*, pp. 398—413.

The suggestions were not adopted or submitted to the legislature. The statesman has still to arise who will fully grasp the subject, and perceive the vast and far reaching advantage of rendering this branch of political arithmetic as complete and perfect as possible. Some nations, which do not possess a tithe of the moral and material interests of the British Empire in such matters, are in advance of us in their census returns.

Many important questions relating to the health, education, food supplies, work and wages, and other matters connected with the industrial occupations, social and moral state, and general well being of the people at large, still await solution. They can only be determined by the accumulated periodical collection of the figures and facts necessary for their right understanding upon a uniform basis, and at shorter intervals than a decennial examination can afford.

At the present juncture, when a new political era is about to commence, when the settlement of the future relations of all classes of the community to each other are of great importance, and the problems connected with capital and labour demand increased attention, we are absolutely in the dark as to many of the most important factors which require to be taken into account. The recent discussion of the question of the housing of the poor shows how complete and absolute our ignorance has been, an ignorance for which there is no valid excuse. The Statistical Society has played its part well in the matter; the responsibility for the prevailing ignorance does not rest with it.*

In addition to notices of the counting of our own people, and of the distant parts of the Empire, the *Journal* has, scattered through

* The committee appointed to examine and report upon Church Lane, St. Giles's, fully justifies this statement, even if the work of that committee stood alone. *Vide* vol. xi, pp. 1—24; vol. xii, pp. 57—60.

its pages, a large amount of information regarding the censuses of every civilized nation, which can easily be consulted by all interested in such questions.

Poverty, Pauperism, and the Poor Laws.

Scarcely of minor importance is all that relates to the condition of the poor, one of the most direct outcomes of civilization, and most difficult social problems of the time. The failures of society, whether from misfortune, misconduct, vice, or the unfavourable conditions somewhat inseparable from life in aggregation, with insufficient means of fighting the battle of existence successfully, have occupied much of the time, and filled many pages of the transactions of the Society. The class known as paupers, as distinguished from the poor who are not absolutely destitute, their circumstances and surroundings, their children and their dwellings, the laws passed for their relief from the time of Queen Elizabeth to the passing of the great Act of 1834, the relations of pauperism to crime; the education of pauper children, and care of their lunatics, and other matters connected with their moral and material condition, have all secured attention.

Among the authorities on these questions have been Messrs. Purdy, Lumley, Fletcher, the late Sir J. K. Shuttleworth, and others. The credit of introducing a sound system of statistics of pauperism is due to the first named of these gentlemen, for many years the responsible head of the statistical department of the Poor Law and Local Government Boards, and from 1862-73 a secretary of this Society and editor of its *Journal.*

The history of the reform in this most desirable direction is somewhat singular, and although it is only indirectly connected with the work of the Society, which has however profited greatly by it, is deserving of a place in this record, for it has not hitherto been made known anywhere.

In August, 1856, a severe but well deserved attack was made in the "Times" newspaper upon the statistics published by the late Poor Law Board. "There are no accounts," observed the writer, "which give us so much trouble as those of the Poor Law Board. "Indian finance is mere child's play in comparison with pauper "arithmetic. There is magic in every page; the figures are "plunging and dancing about as the enchanted sword of a "Mussulman," and so on, the article being charged with numerous examples in support.

Mr. Purdy, who was not then at the head of the department, in the absence of his chief was required to report on the article. He could not controvert the very serious charges, but indicated the manner in which the statistics of the department might be

entirely recast, so as to avoid similar imputations in the future. His suggestions were adopted, and when he became chief of the statistical bureau of the office, were carried into effect. They are submited periodically to the legislature under the head of poor rates and pauperism, are largely quoted by the Press, and have now been before the country for seven and twenty years, without again being challenged, and our transactions have reaped the benefit of them.

The poor law unions follow the topographical arrangements of the census of 1851, which have been continued in the subsequent censuses. This new classification has been found eminently serviceable in the administration of the poor laws.

In the pages of our *Journal* will also be found much interesting information regarding the corresponding classes of other countries, and had not the international statistical congresses come to an untimely end, the task was assigned to me of preparing a general statistical statement of the results of the measures adopted for the relief of the destitute throughout the civilized world.

I hope this task will be undertaken by some member of this Society more competent than I am to do justice to it.

Crime and *Criminals* have been carefully studied from the statistical standpoint, to show in circumstances mentioned the increase or diminution of crime, the classification, causes, and influences operating in the commission of criminal acts;* the education of criminals; sex, age, and education in their relations to crime; the statistics of particular crimes such as larcenies, felonies, burglaries, thefts, robberies, prostitution in its criminal relations, criminal law and law courts, executions, police, and most of the moral, social, and legislative questions connected with breaches of the criminal law.

Education has received a larger share of attention than most other kindred subjects. In addition to several reports of special committees of the Society, there are many papers of value on primary, secondary, and higher education, and a considerable collection of statistics of education in other countries, to be found in the permanent records of the institution.

It can scarcely be doubted that, with the aid of other societies and associations engaged in similar inquiries, the labours of this Society exercised a powerful influence on the spread of accurate information on the subject, and thus to a considerable extent helped in shaping the legislation which has given so great and beneficial an impulse to the education of the people. The communications of Rawson, Fletcher, Porter, Heywood, Edwin Chadwick, Tremenheere,

* Not the least important of the subjects discussed under this head is the relation of crimes of the most serious order to the mental condition of the class known as imbeciles.

Longueville Jones, Mary Carpenter, and Sir J. K. Shuttleworth may be consulted to some advantage on this most important factor in the history of the progress of the nation.

Postal Communication, which is nearly as important an element of educational advancement as it is of social value in all the relations of national life, has not been neglected by the Society, as may be seen by consulting the third and fourth volumes of the *Journal*, the papers of the great reformer Rowland Hill on the effects and results of the introduction in January, 1840, of the uniform penny rate. The marvellous development of the great principle then established in the same and in other economic directions, which have exercised their beneficial influence on all mankind, are among the most humanising and successful agents of civilization, for which the whole world is indebted to England and her gifted son.

Railways.—Railways and steam communication again must be placed in the same category of instruments of progress and of national and commercial advancement with education, cheap postage, and the other peacemakers, which may safely be relied on in time to fulfil their ultimate aim and object, so far as material agencies can tend to secure the accomplishment of such a result, the binding of all nations in one great brotherhood of mutual interest and friendship.

As respects railways in their construction, management, extension, traffic, relations to other modes of carrying passengers and goods, the legislation to which they have given rise, their gauges, accidents, fares, stock, and other conditions which are susceptible of the application of the numerical method, the Society has worked with good effect.

The papers of Mr. Dudley Baxter (vol. xxix) on railway extension and its results, and of Mr. R. Biddulph Martin on the purchase of railways by the State (vol. xxxvi), which gave rise to a long and important discussion, and the remarkable paper of Mr. E. Foxwell, are leading landmarks in the history of those methods of transit and travel.

Steam navigation, on the other hand, has received little special attention, and there is nothing in the records of the Society of any particular interest on the subject. This is a serious and regrettable omission, for England is essentially a maritime country; her navy is, or ought to be, the most complete in the world for the protection of her territories and commerce, and her unrivalled steam fleets are monuments of the wealth, enterprise, and industrial progress of the nation. At the same time there is no branch of commercial arithmetic which lends itself more readily to statistical inquiry, than the statistics of shipping, shipping

casualties, and shipwrecks, as some notices scattered through the pages of the *Journal* show.

Taxation, again, next to the numbering of the people, is one of the most important branches of political arithmetic, and one of the most difficult to determine on grounds of justice and expediency, and in strict accordance with the accepted principles of economic science.

Imperial and local taxation, direct and indirect systems of levying taxes, assessed taxes, income tax, customs, excise, and taxation in relation to revenue, have all been carefully considered and recorded in the transactions of the Society, by economists of such weight and authority as Newmarch, Palgrave, Scott, J. E. Thorold Rogers, Purdy, Guy, Hendriks, Dudley Baxter, and others, whose names alone are sufficient to prove the value of their contributions to this branch of political economy.

Commercial statistics are ably treated by Leone Levi, Porter, Danson, Valpy, Newmarch, Bourne, and Glover, and will amply repay study.

The statistical treatment of imports and exports, gold and silver, as illustrated by Stanley Jevons, Giffen, Patterson, and others, with loans, national debts, prices, and wages, particularly the two latter, are all contained in the records of the Society, and associated with the labours of some of its most eminent members, Tooke, Newmarch, and Jevons, who have passed away, and others scarcely less eminent who are still happily among us.

On the representation of the people there are several papers of interest and value, and notably by Mr. Newmarch, Mr. J. B. Martin, as well as that on the representation of minorities by Mr. Hare, which still continues to attract attention.

Vital Statistics are abundantly and well represented in the transactions of the Society, yet leave much unaccomplished and desirable work in this direction untouched. In addition to reports from special committees on hospital statistics, the papers on sickness and mortality generally of the venerable founder of the regulation of public health, one of the founders of our Society, Edwin Chadwick; with those of Drs. Guy and Farr, Edward and Graham Balfour, Steel, Longstaff, Messrs. Hendriks, Neison, Humphreys, being of exceptional value and interest. A mere examination of the heads of inquiry will show their extent and important bearings. Among them are births, marriages, and deaths, registration, ages and occupations in their relation to health and mortality; epidemics and such diseases as small pox, fevers, consumption, and cholera, migration, food, climate, sanitary conditions, meteorology, assurance, and other points of scarcely minor importance, are all touched upon in more or less detail.

The application of the statistical method to the higher biological problems may be said to be in its infancy, and medical statistics generally, in their strictly scientific relations, are as yet comparatively unexplored fields of research, containing abundant material for future investigation, of which the importance can scarcely be overestimated.

Banks and Banking.—The agencies engaged in the monetary transactions of every day, and of business life, the clearing house, and the currency of the United Kingdom, are questions for the solution of which abundant materials exist in the pages of our *Journal.*

They deal with all classes of banks and banking operations; their influence on the currency and commerce; their relations to great commercial and monetary crises; the wisdom or unwisdom, according to the views of the different schools of economists, of the restrictions on commerce exercised by the different Bank Acts; the peculiarities of the English, Scotch, and Irish systems of banking, and similar matters regarding the part played and the influences exercised by those important institutions. The views of the most eminent authorities of the age on some of these questions are contained in our transactions.*

Presidential Addresses.

The history of the *Journal* would be incomplete without a short notice of the presidential addresses which adorn its pages, and which are strongly stamped with the individual impress of each of the statists who have successively ruled over us.

They were commenced by the late Earl of Harrowby, thrice President of the Society. At the seventeenth annual meeting in 1851, on resigning the chair, he reviewed briefly the subjects which had been considered during his term of office, and dwelt upon the importance of educating the country at large upon the true principles of statistics, and the proper method of conducting statistical inquiries, so as to inspire confidence in the results of investigations tending to the public good, and in particular to the comfort and happiness of the poorer classes of the community.

There is no other detailed record in the transactions for some years afterwards of addresses from the chair, either on assuming or quitting office, although it is probable that such addresses were sometimes delivered, from an occasional passing reference to the subject. At the nineteenth annual meeting in 1853, the President, Lord Overstone, is reported to have given a lengthened address on the subject of the annual report, and his speech was said to have

* An index showing the number and nature of the papers contributed by individual members of the Society (see p. 359) forms Appendix IV. It is arranged alphabetically for readier reference.

contained a lucid and able exposition of the objects of the Society, and of the principles and utility of statistical science.

It is to be regretted that this address has not been preserved, as Lord Overstone was not only the stoutest opponent of any change in the restricted plan originally proposed by the founders of the Society, of whom he was one, but was a man of much originality and force of character, who greatly influenced the fiscal legislation of the country for a considerable period.

The present practice of an inaugural address on the election of a new President was originated by Mr. Newmarch, at the commencement of the session 1869-70. He took as his subject "The progress and present condition of statistical inquiry," and reviewed briefly the work of the Society from its origin, concluding by indicating the direction which that work should take in the immediate future. This excellent discourse may still be studied with advantage, for there is much yet unaccomplished which he deemed to be desirable and necessary.

The next inaugural address was given by Mr. Newmarch's successor, Dr. Farr, in November, 1871. The purport of it was to endeavour to persuade the Society and the public, to extend the science which the former was founded to promote. It was mainly a political discourse, without a shade of party colouring. In it incidentally the work of Babbage, and other original founders of the Society, was noticed with care and discrimination.

A second address by Dr. Farr in his second year of office was delivered in November, 1872. It traversed much of the same ground, indicated the importance of international statistical congresses, remarked upon census returns, and recorded in a few well chosen sentences the deaths of distinguished members during the year.

The addresses above recorded were strongly marked with the personal characteristics of their authors, close reasoning, scrupulous avoidance of purely controversial matters, perfect mastery of the subject in hand, and lucid exposition of the highest order.

After these came the discourses of Dr. Guy in 1873-74, which treated largely of the dangerous classes, and generally of social science, with reference to the labours of John Howard; and those of his successors to the present time, whose addresses when looked back to in the future will be found to sustain and continue the great and exalted aims of the founders of the Society. They are in truth land marks in the history of statistical research and its practical applications. Most of them belong to the important branch of political arithmetic, and are models of purity of style and close reasoning in the statement of questions of current social and political interest. They are all without the faintest trace of

party feeling, or the raising of those undesirable discussions calculated to excite passion and prejudice, which were so much dreaded in the early history of the association.

More it would be unbecoming to state whilst our distinguished leaders are still to the fore; less would have been a grave omission in the record of our work.

This lengthened, but in reality brief and bird's-eye view of the published transactions of the Society, gives after all but an incomplete and imperfect retrospect of the contributions to statistical science contained in our records. What has been done has been well done. That there is still more to be done is undoubted; for is not the science of statistics still on the sea shore of Newton, gathering a few pebbles here and there, with the vast expanse of the ocean of Truth remaining to be investigated beyond and before it? The past may, however, be fairly accepted as an indication of the future.

The motto of the Imperial Academy of Sciences of St. Petersburg is "Paulatim."

Should a fresh apothegm be needed for the encircling band of our wheatsheaf, I know of no sentiment more appropriate.

In the great works of nature all accretions have been formed grain by grain, until they have piled up the mightiest mountains, and, like the microscopic coral insects, raised great reefs above the surface of the ocean, and fitted them to become the abode of man, and of all the kingdoms of nature with which he is surrounded, and which minister to his comfort and well being. So it is with statistical inquiry, which gathers its facts singly, and then considers them in the aggregate, from which alone can be evolved the laws which govern them. This I hold to be the true aim and end of statistical research.

Personnel of the Society.

When an institution does approved work of a high order, whether moral or material, and exercises an undoubted influence for good in its sphere of action and the field of its labours, some knowledge of the workers is not only of sufficient interest to find a place in its history, but the history would be incomplete without it.

The earliest Patron and Honorary President of our Society was the illustrious Prince Consort, well versed in the learning of his time, with mathematical knowledge of a high order, and a special acquaintance with statistics, as certified by one of the greatest masters of the science, who taught him in early life, and as revealed in his exceptionally able and masterly address to the International Statistical Congress held under his Presidency in

London, in 1860. Of this address our late President Dr. Farr, who was present at nearly every congress which met, stated, "it "was admitted by all that none of the addresses, by princes or "ministers, equalled in merit that of the Prince Consort." In his life it is mentioned that he was instructed in the principles of statistics as a science by M. Quetelet, and that the Statistical Society had particular attractions for him, which he had turned to practical account in his systematic observation of social and political phenomena.

His Royal Highness attended two of the meetings of the Society, and took part in the discussions in a manner which showed to those who were present his readiness in debate, and his perfect mastery of the questions under consideration. It is to be regretted that no published reports of these discussions exist, for all too little of his work has been made known to us.

His Royal Highness the Prince of Wales, the future Sovereign of the British Empire, now occupies the office filled with so much distinction by his father, with whom he shares an active participation in all those good works which tend to the happiness and welfare of the poorer classes of his future subjects, and which are so much indebted to statistical inquiry and research for the solution of the difficult social problems connected with them.

In the twenty-six presidents who have guided the labours of the Society during the fifty years of its life, there have been no less than ten statesmen of the highest rank, two of them prime ministers, who occupy foremost places in the history of the century, and all of them men of light and leading. Some of them have been able administrators, little inferior to those above referred to, or remarkable for special gifts, as Lords Overstone and Houghton. In the more strictly working chiefs, political arithmetic, economic science, and vital statistics have been well and efficiently represented. The rapid interchange of presidents has thus proved of great advantage to the Society and the science, and the addresses of some of them have interested the whole nation, and been largely reproduced in the published discussions of the time.

The vice-presidents, of whom four are nominated annually by the president of the time being, have all been working members of the Society, active in the promotion of its interests, and contributors to its transactions.

The secretaries, one of whom has always performed the onerous and important duties of Editor of the *Journal*, have also been active members, and devoted much time and attention to the work.

To individualise the members who are or have been associated with the working of our institution, would occupy too much space in this sketch.

To enumerate a few of the names of those who have passed away, and will ever occupy niches in the temple of fame, I have merely to mention Porter, Tooke, Babbage, Whewell, Richard Jones, Malthus, Farr, Newmarch, Dudley Baxter, Jevons, Lords Jeffery, Macaulay, Lawrence, and Lansdowne, the descendant of Sir William Petty, the father of political arithmetic; Grote and Hallam, the historians and philosophers; Fletcher and Jacob Waley, Roderick Murchison the geologist, and many other men of mark in their time. These alone are sufficient to show how important a part the study of statistics occupied in the minds of some of the leading spirits of the age, and how valuable must in consequence be the Society to which they lent their names, and gave some portion of their time and attention.

It would be impertinent to select for special mention any of those still alive, active and earnest among us. Long may they continue to be so; but I may, I feel sure, say that as a body they are in all respects fit successors of their gifted predecessors, and that the science of statistics runs no risk of losing ground in public estimation, or of being less useful to the legislature and the nation in their hands.

The science of political economy is at present in some disrepute, and the accuracy of several of its most important doctrines has been seriously questioned.

Where real fallacies have been detected it has been by the scientific labour of the statists, and it is by the same agency, guided by such minds as those of Porter, Adam Smith, Tooke, Babbage, Fawcett, Newmarch, and Jevons, in the past, and others equally distinguished in the present, that it will be rehabilitated and placed on the high and impregnable hill of Truth, from which no declamations of interested demagogues, and no *ad captandum* fallacies of party politicians will be able to dislodge it.

Of our foreign members the list is also long, and includes some of the most honoured and distinguished men of the age in all countries, from Quetelet and Alexander von Humboldt in the past, to those who adorn our muster roll in the present.

Those of us who have had the good fortune to come into personal contact with them in any of the international statistical congresses, must have felt that high mental and moral culture, earnest devotion to scientific pursuits, and pure love of truth for its own sake, are the characteristics of those who cultivate statistics all over the world, whom no mountains nor seas can really separate, and who are one brotherhood, of whatever nationality they may be.

The Work of the Committees.

In conformity with one of its chief early resolutions, the Council of the Society in the beginning of its work resolved itself into committees* to investigate special branches of statistical inquiry, and to record the results. The chief subjects selected were primary instruction, the condition of the poor, friendly societies, vital and hospital statistics, and strikes. Questionaries were carefully framed calling for information on each of those topics, and specific personal examinations were instituted to verify and extend them. Private and paid agency were volunteered or enlisted, and a vigorous effort was made to add exactness to our knowledge, or rather to dispel our ignorance of important social agencies, touching which nearly all was at that time, and much is still, mere matter of conjecture.

The recent inquiry into the housing of the poor is a striking example of this.

The most valuable of the reports were on education, beneficent institutions, the condition of the poor in certain districts, and hospital statistics. They covered, however, but a small portion of the ground to be occupied, and touched but its fringe.

In a very few years the Council of the Society arrived at the conclusion that by attempting too much the committees had accomplished little, a reproach which I think attaches to all the great bodies which have been organised to deal with scientific and social subjects.

More stringent rules for the working of the committees were laid down and followed, as our records show; but this mode of procedure was early abandoned, as it was felt and found that a body of earnest inquirers with limited funds, and still more limited leisure at its command, was unable to cope successfully with the vast amount of material which it was necessary to gather together, examine, and analyse.

Moreover, the labours of this and other similar societies have created a desire for such investigations that did not formerly exist; private individuals and public bodies have instituted and carried out investigations of great interest and value; the State took up some portions of the work, with means and instruments which no voluntary association could command, and the Statistical Society gradually abandoned it, having by no means employed its time or funds unprofitably, in what it had undertaken and accomplished.

* The lead in this direction was taken by the Statistical Society of Manchester, established in 1833, and still an active and efficient working institution in full vigour. It also has done much good and important work.

That some means should be found to continue the work is, I think, desirable and necessary, and it can probably be best accomplished, as in other branches of science, by the endowment of research.

Endowment of Research by the Society.

This leads naturally to an examination of what the Society has done in this desirable direction.

In 1870 a valued member, the late Mr. William Tayler, placed in the hands of the Council the sum of fifty guineas to be awarded by them as a prize for the best essay on the question of the Local Taxation of the United Kingdom.

The conditions of the proposed essay were carefully drawn up, and embraced a comprehensive view of the subject since 1850, to be accompanied by full statistical details. It included also a reference to the systems of taxation of other countries as aids in illustration; the principal purpose of the essay being to exhibit a complete chart of the local taxation of our own country, with suggestions for its improvement in principle and in machinery.

The offer of the prize produced two essays of considerable value, both of which are published in the 34th volume of the *Journal*, and were deemed by the Council to illustrate strongly the importance of the class of inquiries to which the Society was devoted.

The questions of local government and taxation are tolerably certain again to come to the front in the legislation of the near future, when the great value of these essays will be fully appreciated as types of accuracy and thorough reliance. They will also afford safe guidance in the conduct of any new inquiry that may be considered necessary.

The report on local taxation presented to Parliament in 1870 by Mr. Goschen, when president of the Local Government Board, and his speech in the House of Commons in 1871 in introducing his Bill, showed in what terrible confusion the whole question then was, and in which it still remains so far as legislation is concerned. Mr. Goschen's statistics, for as a statesman he relies much on statistics, were prepared for him by Messrs. Giffen and Purdy, distinguished members of our Society. The tangled web can only be unravelled by the skilled application of the political arithmetic which it is one of the chief functions of the Society to cultivate and advance.

The Howard Medal.

In January, 1873, Dr. Guy read a paper on John Howard as a statist, that year and month being the centenary of the philanthropist's appointment as high sheriff of Bedford. In his inaugural

address as President of the Society, in November of the same year, Dr. Guy again referred to Howard as a true statist whose name ought to be indissolubly connected with this Society as even more a social than a prison reformer.

After a brief sketch of Howard's history, to illustrate what statistics in the hands of a master could effect, in accomplishing the greatest victory achieved single handed in the parliamentary history of England, Dr. Guy in referring to the form which the recognition should take, spoke as follows:—

"If I am asked what shape this recognition ought to take, I "answer, some act of ours to show that we have taken note of the "fact that this year, 1873, is the centenary of Howard's appointment "as Sheriff of Bedford; this session of 1873-74, the centenary of the "great statistical inquiry which had as its immediate result the "removal of one of the greatest reproaches that ever stained the "fair fame of England. Dr. Hyde Clark, an esteemed member of "our Council, has suggested to me that an appropriate, enduring, "and useful memorial of the year and session would be a Howard "medal, to be awarded every year to the author of the best essay "on one of the many social questions which Howard had studied."

The proposal was referred to the Executive Committee, who reported favourably of it, and immediate steps were taken to carry it into effect, and to announce that the subject of the medal for 1874 would be "The state of the prisons, and the treatment and "condition of prisoners of England and Wales during the last half "of the eighteenth century, as set forth in Howard's 'State of "Prisons and Works on Lazarettos.'"

Hospitals, the dwellings of the poor in rural districts, and other cognate subjects have been considered. The most important essays have probably been those of Dr. Steel and Mr. Lawson Tait, of Birmingham, on hospital statistics, the former of which has been published in the *Journal*, and the latter as a separate work, and the valuable essay on Education of Miss B. Jourdan.

Recently the conditions for the Howard Medal have been extended, so as to embrace cognate subjects not contained in the writings, or included in the work of the great reformer, but without disassociating his name with the medal.

The Pochin Prize. Newmarch Memorial Essay.

In 1882, Mr. Pochin, a Member of the Council of the Society, placed at its disposal 100*l.* for a Newmarch Memorial Essay, "On "the Extent to which Recent Legislation is in accord with, or "deviates from the true principles of Economic Science; and "showing the permanent effects that may arise from such legis-"lation."

Six essays were submitted in response to the call, but as the determination of the award did not fall within the limits of the period embraced in my narrative, the result must be left to the historian of the future.

I know of no good reason why occasionally some portion of the liberal Government grant for the encouragement of scientific research should not be shared by the Statistical Society, which stands in the same relation to political economy and sociology, that the most ancient, learned, and leading association of the country, the Royal Society, does to physical science.

It cannot for a moment be contended that the solution of the problems connected with mankind in association, and all the conditions which characterise and influence modern life in aggregation, is of less importance to the happiness and well being of the whole community, than purely scientific research as represented by the Royal Society. The proper study of mankind is man, and the inherent difficulty of this study, from the absence of the fixed conditions which characterise physical investigations, or those of pure as distinguished from applied science, render it additionally desirable that the former should receive at least equal encouragement with the latter. They need no costly laboratories or technical institutions, or expensive machinery and agency, specially trained; but they do demand the highest culture, and corresponding mental and moral qualities on the part of those engaged in such investigations.

In all the recent discussions regarding the condition and housing of the poor, the absence of correct statistical data regarding any one of the conditions of their inner lives, has been felt and deplored. And so it will continue to be until the proper conditions of determining such questions are observed, and proper encouragements for their study are afforded either by the State, or by such associations as the Statistical Society. In no other way can legislation regarding them be placed on a sound and secure basis, or the limitation of State interference in private affairs and personal relations be accurately determined.

Housing of the Society.

The suitable housing of the Society has been a trouble from its origin to the present time, and still remains an unsolved difficulty. It will rapidly outgrow its present accommodation, which is insufficient to find room for its meetings, or to allow its excellent library to be utilized in a manner befitting its extent and importance.

In the commencement of its career the Society accepted the hospitality of the Literary Society in St. Martin's Place, but soon

found those quarters too restricted for its rapid extension. It removed to Regent Street, where the rooms were said to have been handsome, capacious, to admit of a larger attendance of members, to afford improved accommodation for the meetings of the council and committees, and to allow of the collection of books being better arranged, and the catalogue rendered in consequence more complete. From these quarters it migrated in a few years to the lower floor of the London Library in St. James's Square, for a longer time.

Here again it became cramped for room, and the library needed the space for its own uses. It was accordingly transferred to the official residence of the Principal of King's College, which was obtained through the intervention and good offices of Dr. Guy. The occupancy was limited to the duration in office of the late principal, now Bishop of Sydney, and the rooms were adapted, as far as circumstances permitted, to the joint occupancy of the Society and the Institute of Actuaries, which had long been, and still is, their copartner in tenancy.

The Society, on Dr. Barry's translation, was again driven into the wilderness of London, and is now encamped on the receded bank of the Thames, with greater fixity of tenure, but equally little likelihood of taking root and flourishing there.

Some years since a determined effort was made by Dr. Guy and Mr. Newmarch, to procure a recognition of the Society from the State to be placed on the same footing as the Royal and other societies, for the location of which fitting abodes had been found in Burlington House. This claim was urged with much force by Dr. Guy in 1870, in his paper on the claims of science to public recognition and support. For this many apt and apposite examples were quoted, and much close and logical reasoning was expended in vain. The Government failed to rise to a knowledge that, of all branches of science there is not one of greater value and more immediate service to statesmen, than that of political arithmetic. Without its guidance, legislation in most of its domestic and external bearings, commerce in its minutest relations, industry in all its forms, war in its varied aspects, and man in every phase of his social relations, would be as the mariner without his compass, a helpless wanderer on a vast ocean and pathless desert of doubts, difficulties, and conjectures, without the aid even of the stars to guide him aright.

A federation of the London Societies, in the form of a limited liability company, was set on foot by Mr. Newmarch, and seventeen of those associations answered the proposal favourably. Indeed, so many of them had virtually consented to take action, that a site was selected, plans and estimates of an appropriate building were prepared, and all seemed on the eve of realisation, when some of

them withdrew, preferring to have habitations of their own, and the project failed.

The project has not since been revived, but the time has I think arrived to reconsider it in connection with our Jubilee.

Dr. Guy, in his paper above referred to, suggested a well considered plan which had much to recommend it; but as it would need the assistance of the Government, and the Government as a body has at no time taken any great interest in the advancement of science, little reliance can be placed on obtaining such aid in any form.

Dr. Guy's scheme was to complete the beautiful work of the banqueting hall in Whitehall with the addition of a suitable centre to contain the whole of the learned and scientific societies of London, in strict architectural harmony with the elevation of the master piece of Inigo Jones.*

The projected building of a new Admiralty and War Office, the concentration of the civil departments of the Government with the Treasury, and the close proximity of the Houses of Parliament, all point to Whitehall as the official centre of London. In no more suitable situation could the intellectual centre of this great metropolis be placed. A reproduction of Dr. Guy's plan, which is contained in the published records of the Society, is prefixed to this narrative.

The plan of the other building suggested for the improved accommodation of the societies above referred to, was likewise prepared by the late Mr. Thomas Bellamy, an architect of repute. The front elevation of this plan was published in the *Journal of the Statistical Society*, and is here reproduced. The building was arranged for twelve societies, four at least of which were to have rooms large enough for their ordinary meetings. It also contained a theatre for the common use of all the societies, sufficiently capacious for general assemblies, with the necessary subsidiary arrangements for domestic offices, lighting, ventilation, and all the uses of a society's home. The plan shows the space that could be allotted to twelve societies or more, at a cost of about 16,000*l.*, exclusive of the site.

A memorial was addressed to the then Chancellor of the Exchequer in 1871, praying for an interview on the part of the delegates of the societies, asking his aid in securing a suitable site on crown property at some spot bordering on the Thames Embankment, near to Whitehall. Mr. Lowe expressed his readiness to forward the views of the committee, but referred them to the Chief

* Now that the Government has decided to set back Lord Carrington's house, and so open a handsome street to the Thames Embankment, Dr. Guy's plan may perhaps receive the attention it certainly deserves.

Commissioner of Woods and Forests, to whose department the disposal of public and crown lands is entrusted.

Nothing, however, came of it, and there the matter rests at the present moment.

The need for accommodation still exists, and should the question be revived, either in connection with this Jubilee, or otherwise, of any future confederation of the chief societies without permanent homes, the papers connected with the plans above referred to may be consulted with advantage, and it is to be hoped with better success. In so wealthy a community as ours, with so many men earnestly engaged and interested in the professional pursuit of science in its social, speculative, and commercial relations, it is surely not visionary to trust that some one may be found willing to build and endow such an institution, to his own perpetual honour and credit, the service of the metropolis of the world, and the lasting benefit of mankind. What has been done for Liverpool and other cities, can surely be done for London.

Statistics of the Working of the Society.

In Appendix No. II are arranged in a tabular form, and in decennial periods for convenience of reference, the leading statistical facts connected with the progress and working of the Society from its origin to the completion of its fiftieth year.

From this it appears that in the first ten years, 1834 to 1844, 696 members had been enrolled or were elected after the framing of rules for admission, of whom nine had died, and 180 were withdrawn from various causes. Several had in the first instance entered their names as members, who did not join permanently, and in the course of the years which have since elapsed, there has been a small number of defaulters.

The number elected in the succeeding decades were 242, 258, 455, and 782, showing a steady increase, as do the deaths, 35, 90, 93, and 133. The latter were to be expected, as many members joined at advanced ages, a considerable proportion of them as life members, so the figures have no further significance. The withdrawals are, as in every similar association, fluctuating figures, of which it is often difficult to assign, and of no importance to record the causes.

The income and expenditure of the Society are all shown for each year separately, except the first two, which have been united, as the Society was not fairly constituted until 1835, which has consequently been taken as the statistical date of departure. The figures have been carefully compiled in the office of the Society, and will, I believe, be found to be approximately correct, for there was some little confusion in the records of the earliest years. From

these it will be perceived that in each decade the expenditure has occasionally exceeded the current income. This was, in the beginning, chiefly caused by the sums expended in conducting special inquiries, and at subsequent periods by the cost of printing the indexes and catalogues, with the heavy outlay immediately incurred in changing the quarters of the Society, and the incidental charges connected with each move. A separate statement has been prepared of the cost of printing the *Journal*, and the sums realised by its sale. The whole of the figures for each decade are grouped together in the subjoined table:—

Years.	Number of Members Elected.			Amount Received from Members.		
	Ordinary.	Life.	Total.	Annual Subscriptions.	Compounders.	Total.
				£	£	£
1834–35 to 1844	641	55	696	7,722	1,136	8,858
'45–54	217	25	242	6,254	523	6,777
'55–64	239	19	258	6,115	399	6,514
'65–74	412	43	455	6,838	903	7,741
'75–84	691	91	782	12,318	1,911	14,229
Totals	2,200	233	2,433	39,247	4,872	44,119

Years.	Number of Members.		Annual Income from all Sources.	Annual Expenditure.	Balance.	Cost of Journal.	Amount Realised by Sale of Journal.
	Died.	Withdrawn.					
			£	£	£	£	£
1834–35 to 1844	9	180	9,695	9,550	145	1,786	252
'45–54	35	139	7,964	8,034	− 70	2,817	713
'55–64	90	145	7,897	7,794	103	3,066	695
'65–74	93	81	9,528	9,071	457	3,433	1,255
'75–84	133	244	18,143	16,485	1,658	5,662	1,719
Totals	360	789	53,227	50,934	2,293	16,764	4,634

In the fifty years therefore 2,433 members have joined or been elected, of whom 2,200 were ordinary, and 233 life members. Of the above 360 died, and 789, including defaulters, have withdrawn.

The whole income of the Society during the half century was 53,227*l.*, and the expenditure 50,934*l.*

The *Journal* cost, in printing and publishing, 16,764*l.*, and after distributing copies to each of the members, and to some public bodies, copies to the value of 4,634*l.* were sold.

When it is considered that the amount of the subscriptions is moderate, that there is no entrance fee, and that the Society has not received any great gifts from wealthy men, it must be admitted that its affairs have been conducted with prudence, economy, and

efficiency. If it had produced nothing more than the *Journal*, a vast storehouse of statistical information, which has been termed a monument of science, the expenditure cannot be said to have been made in vain.

The accounts are carefully scrutinised at each monthly meeting of the Council, and audited as carefully at the end of each year, each audited statement being published in the *Journal.*

The Library.

In the original prospectus of the objects of the Society and its plan of operations, one of the most pronounced avowed purposes was the foundation of a complete statistical library, as rapidly as the funds available permitted. This has never been lost sight of. Every annual report contains some reference to the subject, and at each meeting the books presented or purchased are laid on the table—the gifts being greatly in excess of the purchases.

Among the donors were Her Majesty and the Prince Consort. A valuable collection of works has been presented by the widow of the late Mr. Newmarch, and additions of value have been added by the Tooke Memorial Fund. The names of all donors are contained in the printed records of the Society.

The library now consists of nearly 20,000 volumes, in which all branches of statistics in every language of Europe are represented. A detailed and well-arranged catalogue has recently been printed at considerable cost, and copious index volumes are available, in which the transactions of the Society can be studied with ease and advantage.

The library also contains a valuable collection of charts and diagrams, and portraits of some of the most distinguished members, including one of the first patron of the Society, the late Prince Consort.

Although still incomplete, it is probably the most extensive collection of statistical works in existence.

Rules and Regulations.

A code of rules was drawn up by the Provisional Committee in 1834. They have undergone slight changes from time to time. The additions and alterations fairly represent the advances in the view of the Society as to its nature and functions, but have never lost sight of the purposes for which it was instituted.

The original rules and those now in force are placed, side by side, in the Appendix III.

The Society consists of fellows and honorary members, and is ruled over by a President and Council of thirty-one members, from whom four Vice-Presidents are selected every year, and a Treasurer, and four Secretaries are appointed, together with three Trustees.

The past Presidents, when their term of office has expired, become permanent Honorary Vice-Presidents for life. All the above offices are honorary.

There is besides a very small paid staff. A strong council was appointed in the beginning, to admit of its being subdivided into small special committees, to conduct investigations in particular branches of statistical inquiry. The sub-committees have long since disappeared, for reasons already stated, but the strength of the council has undergone no change.

The only permanent sub-committee is an executive committee composed of the chief executive officers of the Society, and a library committee appointed annually.

All papers are examined by referees from the council, prior to their being read and published.

The Fourth International Statistical Congress.

The International Statistical Congresses which have met in the different European capitals have no immediate connection with the history of the Statistical Society, except in the case of the Fourth, which was held in London in 1860, under the presidency of the Prince Consort, the Honorary President of the Society, and was worked chiefly by the officers and members of the Society.

The object of the institution of this body, which was one of the outcomes of the Exhibition of 1851, was to endeavour to secure uniformity in the official statistics of all countries, so as to admit of their comparison with each other. Its further intention was to gather together the statistical data required for the solution of scientific or administrative problems; to spread abroad a taste for statistical inquiries by making known generally their utility; and to bring together those engaged in such pursuits, so as to establish a bond of union, and a frequent personal interchange of views on statistical questions.

The guiding spirits of the London congress were the permanent members of the Statistical Society, and the field occupied in its discussions was extended and important.

It included statistical publications; judicial and criminal statistics; the subdivisions, transfers, and burdens of real property; sanitary statistics; the census; army and navy statistics; statistical methods and signs; international statistical abstracts; statistics of literature, and meteorological statistics—far too large an array of subjects to be properly considered in any week of work.

The congress has ceased to exist, for reasons which have never been accurately ascertained. The last met at Buda-Pest in Hungary, in 1876. The next was to have assembled at Rome, but never came off. The work of the congress was in its later days continued in

the intervals of its meetings by a permanent commission, which last met in Paris, and was probably in itself a more important and useful body than the congress itself. It is not improbable that the too strictly official character of the congress caused its collapse. But to whatever cause it may have been due, an attempt to assemble the permanent commission in London later on, failed likewise.

The cardinal defect of the congress was its attempting too much, and to make the resolutions passed at the general assemblies binding on the several Governments which sent official delegates to its meetings.

Science has no need of the support of authority to establish its truths, whilst ruling authorities cannot afford to disregard those truths in their legislative and other actions. They had much better be independent of each other, as they are in England, and act with the unfettered freedom which can alone secure satisfactory results. Hence I hope that some *modus vivendi* for international conferences on statistical subjects may be found which will continue the work of the congresses in the future, freed from the trammels and difficulties of the past.

Review of the Progress of the Society.

After six years of the working of the Society strictly upon the basis of the plan originally drawn up by Mr. Hallam the historian, the Council thought it necessary to review its position very carefully, with a view to determine the best manner of continuing its work in the future. This was done because the rapid progress of statistical investigation in England had shown that its purposes had often been mistaken, and it was deemed desirable to guide it into the right path, lest it should produce evil instead of good, from the inevitable resultant of erroneous conclusions from false premises. The misuse of figures as exponents of facts, had already created a popular conviction that by the manipulation of figures anything could be proved.

The scope and system of its labours were therefore carefully detailed and explained, and statistics were re-grouped in the following sections :—

I. The Statistics of Physical Geography, division and appropriation, or geographical and proprietary statistics.

II. The Statistics of Production, or agricultural, mining, fishing, and commercial statistics.

III. The Statistics of Instruction, or ecclesiastical, scientific, literary, university, and school statistics.

IV. The Statistics of Protection, or constitutional, military and naval, judicial, criminal, and police statistics.

V. The Statistics of Life, of consumption and of enjoyment, or of population, health, the distribution and the consumption of the commodities of life, and public and private charities.

These general heads were subdivided into fifteen more detailed sections, available for purposes of comparison, and susceptible of the minutest further divisions, according to the multifarious details of the affairs of life.

It was then explained that all the departments of statistics above described, may be cultivated to the development of as many branches of moral science, and to the attainment of that true insight into the actual conditions of society, without which the application of remedial measures is purely empirical.

"Under this conviction the original prospectus announced the "intention of the Society carefully to exclude all opinions from its "publications, not assuredly with a view of discouraging the "proper uses of hypothetical reasoning, but for the purpose of "devoting the pages of its transactions to facts and not to "systems."

This was the key note of the work of the Society for several more years, until in 1865, in the thirty-first year of its existence, Dr. Guy in his learned and philosophical essay on Statistics,* and on the proper functions of a Statistical Society, permanently enlarged the scope and aims of the association beyond the mere collection of facts, irrespective of the use to which they are put, a view which has not since been lost sight of.

In November, 1869, in his inaugural address as President of the Society, Mr. Newmarch again reviewed its progress to that time, noting in particular the great advances made in statistical inquiry and study since its formation a third of a century before, and the changed condition, particularly of foreign countries, in this respect, rendering necessary corresponding extensions of the field of observation and record. He accordingly rearranged with his usual clearness and precision, the subjects of inquiry in which such clear and positive results had been obtained, as to be generally accepted as established scientific truths. They were eight in number, and are deserving of reproduction here as land marks of permanent interest and importance in any published record of the accomplished work of the Society, leading as they did in his hands, and as they do still, to a proper appreciation of future progress and the direction it should take. They were :—

1. Vital statistics, including births, deaths, and marriages, diseases, and epidemics.

* "On the Original and Acquired Meaning of the term 'Statistics,' and on "the proper functions of a Statistical Society, &c.," by W. A. Guy, one of the Honorary Secretaries of the Society.

2. Census statistics including the races, occupations, ages, social conditions, and the distribution of the people.

3. Statistics of pauperism, police, and crime.

4. Fiscal and financial statistics, taxation, funding, savings banks, currency, and life assurance.

5. Statistics of conveyance, including railways, steam vessels, and public carriages.

6. Trade statistics, both as regards foreign and national commerce and navigation.

7. Statistics of education, primary, intermediate, and collegiate.

8. Statistics of the cost and effects of central and local government, including the maintenance of armed forces of all kinds.

These groups were so arranged as to "graduate from top "to bottom the degree of success attained." Each of them was considered in succession, and its value estimated by this eminently skilled and accurate observer, who considered that in the first four substantial progress had been made in the preceding thirty-five years; whilst in the last four of the eight divisions, the progress made could not be regarded as "more than the foundation "of scientific knowledge to be arrived at hereafter in a more "complete form." Mr. Newmarch then proceeded to sketch the fields of statistical research in this country, which require most early attention.

They were eighteen in number, and are reproduced *in extenso*, because most of them are still nearly as incomplete as when they were urged upon the attention of the Society fifteen years ago, and because they indicate clearly important work for the Society remaining to be done at present. They were:—

1. The annual consumption per head among the different classes, and by the nation as a whole, of the chief articles of food, corn, butcher's meat, tea, coffee, sugar, tobacco, wine, spirits, and beer.
2. The annual production in agriculture, minerals, metals, ships, and manufactures.
3. The comparative wages, house rent, and cost of living in different parts of the country.
4. The total annual income and earnings, and the total annual accumulations of different classes, and of the country as a whole.
5. The relative taxation of different classes in this country as compared with the same classes in foreign countries, the competition of which England has to understand and meet, carefully attending in the inquiry to the comparative merits of direct and indirect taxation.

6. The financial and economical cost entailed by extensive warlike armaments.
7. Periodical statistics of public hospitals in the metropolis and the large towns, with a view to a comparison of the efficiency and cost of the relief.
8. Periodical returns of the income and operations of charitable trusts and endowments for relief and education.
9. A statistical ascertainment of the numerical strength of the different religions, churches, and sects.
10. Statistical evidence of the cost to the community in sickness, excessive mortality, poor rate, expenditure of dwellings, and sanitary regulations.
11. Statistical evidence of the gain to the community of instruction in popular schools in the rudiments of political economy, in the commoner industrial arts, and in military exercises.
12. Statistical evidence of the consequences in this country of the emigration from it.
13. Investigations relative to the advantages and cost to this country of the occupation of India.
14. An investigation on grounds of fact of the effect of commercial treaties, especially of the French treaty of 1860.
15. A similar investigation of the consequences produced in the United States by the rigid system of protective tariffs.
16. And by the protracted suspension of specie payments.
17. Statistical inquiries relative to the effects produced in Europe on commerce, accumulation, invention, prices, and the rate of interest, by the gold discoveries in California and Australia.
18. Investigation of the mathematics and logic of statistical evidence; that is to say, the construction and uses of averages, the deduction of probabilities, the exclusion of superfluous subjects, and the discovery of the laws of such social phenomena as can only be exhibited by a numerical notation.

Of these groups of subjects the Author said truly that they extend over a large surface, and the lapse of years, with the intelligence and zeal of a phalanx of workers, will be needed to master them.

Part II.

What the Society has done for the Science of Statistics.

It would be out of place in this *résumé* of the work of the Society during the half century of its existence, to attempt to define the exact meaning of the word statistics—an unfortunate term to have been adopted originally—for definitions are proverbially the stumbling blocks of philosophy. It would be equally ill timed to enter into the still unsettled controversy, as to whether it is merely a method, or has any claim to be considered a science.

The learned Engel, at the International Statistical Congress held at the Hague in 1869, stated that there were no less than one hundred and eighty definitions of the term, each based upon the view taken by its proposer of the nature and objects of statistical inquiry; that it was impossible to define its limits; and that the objects and limits of statistics, and its position in relation to other sciences, had better be left to those engaged in its investigations, an exact definition being beyond the reach of determination and useless to discuss.

It is sufficient for my purpose to state that, the claim of statistics to be a science has been admitted in Belgium, France, Germany, and Italy by the most recent and authoritative writers on the subject; that it has received more general assent in the statistical congresses at which all nations have been represented; and that it has been affirmed by our own Society, notably by Drs. Guy and Farr and Mr. Newmarch, and has found general acceptance with its members, notwithstanding the adverse opinion expressed in the excellent inaugural address of Mr. Shaw-Lefevre, and by Mr. Winnard Hooper in an able paper read in 1881.

It seems to me to be more difficult of proof to deny than to affirm the claim to constitute a special science, of methods from which, and by which alone, the natural laws can be deduced which govern most of the conditions of man, and of many of those of the animal and vegetable kingdoms. It has, I think, been truly asserted that there is not a branch of human knowledge to which it is not closely allied, and for the correct understanding of which the scientific marshalling of figures, and observation of aggregate facts, is not more or less necessary. That the laws deduced from them fall into the ranks of the branches of knowledge to which they belong when they are fairly established, does not, in my humble judgment, invalidate the scientific claim of the agency to which they owe their existence, and without which they would remain as unknown as the constituents and properties of any

compound body which had not been revealed by the agency of chemistry, which in their analysis and synthesis is but an agency or method, which creates nothing and destroys nothing, but simply reveals secrets that would otherwise remain unknown. In the same category appears to me to stand every branch of human knowledge, to which the name of science is applied.

To understand then what our Society has assisted in doing for statistics in the last fifty years, it is necessary to state briefly the position of the question in 1834, and the place it now occupies in public estimation, and in the labours of all those who resort to its methods in their several scientific pursuits. These, in truth, embrace most of the arts and sciences of our time.

According to M. Quetelet, the systematic study and scientific pursuit of the numerical method originated in the present century, and at no earlier date than 1820. It made slow progress at first. It must have been applied to administrative uses, however, at an earlier period, as shown by De Tocqueville in his work on "The "Old Régime and the Revolution."*

The history of statistics in England is told so succinctly in the introduction to the first volume of our *Journal*, that I am unable to shorten it with advantage.

It is as follows:—

"Until within a few years England possessed few works of "much authority embracing all the various branches of the science. "But separate branches of this science have been ably treated by "various writers. Indeed, it is probable that no other country is "so well able to trace in detail the progress of its prosperity during "the last century and a half, since the date of the Reformation, as "Great Britain.

"Towards the close of the seventeenth and beginning of the "eighteenth century Reynolds, Child, and Petty published very

* "Je croyais que le goût de la statistique était particulier aux administrations "de nos jours; mais je me trompais. Vers la fin de l'ancien régime, on envoie "souvent à l'intendant de petits tableaux tout imprimés qu'il n'a plus qu'à faire "remplir par les subdélégués et par les syndics des paroisses. Le Contrôleur-"Général se fait faire des rapports sur la nature des terres, sur leur culture, "l'espèce et la quantité des produits, le nombre des bestiaux, l'industrie et les "mœurs des habitants. Les renseignements ainsi obtenus ne sont guère moins "circonstanciers ni plus certains, que ceux que fournissent en pareils cas de nos "jours, les sous-préfets et les maires. Les jugements que les subdélégués portent, "à cette occasion, sur le caractère de leurs administrés, sont en général peu "favorable. Ils reviennent souvent sur cette opinion, que 'le paysan est "'naturellement paresseux, et ne travaillerait pas, s'il n'y était pas obligé pour "'vivre.'

"C'est là une doctrine économique qui paraît fort répandue chez les adminis-"trateurs."

P. 253. "L'Ancien Régime et la Revolution."
Alexis de Tocqueville.
7th édit., 1866.

" valuable information relating to the commerce, manufactures, " circulation, and finance of the country. At a later period Price, " Arthur Young, and Chambers treated the subject of population " with great ability. Young has left a monument of his talent and " industry in his various publications relating to agriculture; and " Playfair's work on commerce has a high reputation."

" Many other similar publications in particular branches of the " science might be mentioned, but the first which comprehends all " the details of statistical science was Sir John Sinclair's account " of Scotland, which appeared in the year 1791.

" In the year 1793, the Government established a Board of " Agriculture in England, and before its dissolution in a few years " after its establishment, it collected and published some useful " statements relating to agriculture in each county."

The establishment of the Statistical Department of the Board of Trade in 1832, commenced in England the new era in the systematic collection by a department of the State, of facts relating to the condition of the various interests of the British Empire. The statements annually issued, after submission to Parliament, by this body are too well known to need more than their mere mention. To the Board of Trade belonged, and from it have come some of the most able and efficient members of our Society.

In October of the same year the Academy of Moral and Political Science in France was reconstituted by M. Guizot and Louis Phillipe, after its suppression by the First Consul in 1803. It consisted of five sections, of which political economy and statistics constituted the third. Lord Brougham, Hallam, and Malthus were the first Englishmen associated with this branch of the Institute.

In the following year, 1833, a statistical section was added to the British Association, the outcome of which in 1834 was our Society, as already narrated.

It will thus be seen that young as we are in the history of the world, we made our appearance with kindred institutions of similar character, only when the age was ripe for the more exact observation of phenomena and facts of all kinds and classes in physical science, as well as in the moral and social relations of man, in the mixed and complex conditions of modern civilisation and progress.

The very brief analysis already made of the work accomplished, in the review of the papers contained in the *Journal* shows, so far as samples can be accepted as measures of the whole, the nature and extent of the investigations undertaken by the Society, in the wide field of statistical research.

In economic statistics the influence exercised by its labours was summed up a few years since by the late Mr. Newmarch, himself one of the most distinguished of economists, as follows :—

"Perhaps the most important and conspicuous fact to be found "in the history of economic science in the last thirty years is "this—namely, that while there has been no change in the objects "to which it is devoted—no change in the purposes to be worked "out—while these objects and these purposes remain the same in "their broad and general aspects, as they have been from the time "of Adam Smith—there has been a marked change in the methods "according to which it is cultivated. It has ceased to be an "abstract science; it has ceased to be a system of tables and "ingenious reasonings; it has little by little, and by a process "cautious and full of promise, become a science almost entirely "experimental. We have learned that in all questions relating to "human society, in all controversies where the agency of human "beings has to be relied upon for working out even the smallest "results; we have learned that in these inquiries the only sound "basis on which we can found doctrines, and still more the only "safe basis on which we can erect laws, is not hypothetical "deductions however ingenious and subtle, but conclusions and "reasoning, supported by the largest and most careful investigation "of facts."

With respect to the reproach that the branch of statistics devoted to economic science is not pure science, and partakes largely of the nature of an art, the view of this learned and distinguished economist was, "That science, according to the "generally accepted definition, was simply a collection of rules and "laws, and of statements of general results. The end of all science "is knowledge, purely and simply. It does not concern itself with "precepts, it does not concern itself with applications and utilities, "it confines itself to a specific declaration that such and such is the "order of nature, and there its teachings come to an end."

He concluded that "In the case of economic science the con-"nection between the science and the art is more emphatic than "in any of the physical sciences. Not even the smallest problem "in economic science can be worked out, except by the agency in "some form of human beings. From first to last the whole subject "matter of this branch of knowledge is man in society, and the "regulations that will best promote the happiness and comfort of "men living in societies. The connection, therefore, in this case "between the science and the art, between the law discovered and "the precept and practice founded on that law, is so near and "intimate that only confusion and error can ensue from unwise "attempts to separate them."

In all branches of legislation on social subjects, in all scientific inquiries to the investigation of which the numerical method can properly be applied—and there are few to which its application is

not of great and immediate advantage—in every undertaking in which the facts require to be carefully collected and collated, and the figures which are exponents of facts to be marshalled with scientific precision; in every branch of vital statistics, of biological research, of populations in movement, and populations at rest; in practical medicine generally, and in the consideration of the influence of moral agencies on human conduct, statistical inquiry has introduced order, method, and precision, in the place of speculation, conjecture, and uncertainty. In the production of these great results, the Society has played a conspicuous and successful part.

The marvellous rapidity and untiring energy with which each new discovery in science is now pursued and investigated, and observations regarding it are multiplied all over the world, has revolutionised the whole subject of scientific study and research, and opened out in all directions new paths for the application of the numerical method. Indeed, without it the very wealth of information poured forth in continuous, never ceasing streams would, and well nigh does become overwhelming, and productive of confusion, until reduced to order and method by the elimination of error and the establishment of truth from the application of the science, which is the proper function of all such institutions as the Statistical Society.

It is in consequence difficult to define its limits or to restrict its applications, for an examination of most recent works whether in art, science, or literature in which the use of figures is a necessity, shows that it is employed alike by the legislator, the statesman, the historian, the man of business, the man of science, and even the man of pleasure, and in fact by every one engaged in the active affairs of the lives we lead in this age of rapid locomotion, restless enterprise, numberless applications of science to art, manufactures, and domestic economy, as well as in the universal intercommunication of nations.

To specify the exact particulars in which the Society has been of service to the science, would require a detailed examination of each branch of research to show the advances made in the half century. A general review is all that is possible in existing circumstances. It would be well if the Society were occasionally to undertake the task itself, for which the inaugural addresses of the Presidents, and the annual reports afford abundant opportunities. To pursue the subject further would demand a volume to itself, I cannot therefore more appropriately close this section of my task than in the concluding words of his first inaugural address of the late Mr. Newmarch, by no means the least distinguished of our Presidents. He said, "the audience whom I address have at least

"the satisfaction of reflecting that the enterprise they foster—an "enterprise I have shown to be already crowned with large and "solid success—derives its claims and dignity from the very "circumstances that it seeks to advance the condition of men in "societies, by ascertaining with scientific impartiality and precise-"ness, the origin, nature, and effect of those influences which both "delineate and improve modern communities. We disclaim senti-"ment and declamation, but without denying the proper functions "of either under suitable circumstances; we equally disclaim pre-"arranged systems of opinion or doctrine. We believe in no system "except that of truth followed with a single purpose in a patient "spirit and with honest zeal. We owe allegiance to no party or "sect, to no State authority, and to no traditions whether of "earlier or later times. We are not impatient to discover the "whole truth, even as it applies to our own limited field at once; "for we know full well that the growth of scientific certainty has "been, and must always be slow and fluctuating; but we also know "that to the thoughtful honest inquirer the difficulties of the past "are not discouragements, nor its devious windings more than "incentives to fresh efforts, persuaded as he is that where "passion, interest, and prejudice do not interfere, the ultimate "end must be some near obtainment of the noblest of all conceiv-"able visions, a vision namely of TRUTH, pure, cloudless, and "supreme."

PART III.

What the Society has done for the Nation.

If it be true, and its truth is not now disputed or denied—for the old reproach, "qu'on peut tout faire avec des chiffres" has long since died out—whatever adds to the successful cultivation of statistics is of advantage to the community at large, and of benefit to each member of it in his personal and aggregate relations. It is impossible, therefore, to separate the scientific from the social and political relations of the question, hence what is true of the one, must be equally true of the other.

It is well known at the present time that statistics have become parliamentary in England and France, classical and popular in Germany, cultivated with success in every civilised country, and administrative wherever there is a representative or settled government.

Few strictly scientific investigations or applications of science to

arts, commerce, or domestic economy are now considered complete until they have been subjected to statistical scrutiny. No commercial or speculative enterprise is entered upon with confidence until its financial and general soundness have been subjected to the same test. No bank, railway, steam company, friendly society, assurance association, or other similar coparcenary of limited or unlimited liability, can secure permanent support unless it can produce an array of figures to attract public confidence, and to retain it if the figures have been collected honestly and in good faith. In all questions of public morality, public health, and public safety; in all matters of philanthropy and benevolence, when they are well and wisely directed; nay, even in the pursuit of pleasure and enjoyment, the same universal law applies. There is not a municipality, or local governing body of the most modest pretensions which does not seek the same aid to test and regulate its progress, correct its errors, supply its deficiencies, and possibly sometimes even to conceal its defects and shortcomings.

In some of the above matters we are in advance of most nations, in others we have fallen behind some of them, for we are still without a well organized central system of collecting, collating, and digesting masses of figures prior to publication, so as to render the results deducible immediately available for practical application. The same ground is occupied by different authorities gathering similar facts in different ways, and for different periods of time, the result being confusion instead of order, undue cost, and difficulty of bringing the conclusions into harmony with each other. The teaching of statistics does not enter at present into our educational arrangements as a special branch of instruction, either in our primary, secondary, or higher curricula, from which some useless subjects might be eliminated with advantage, to make way for it. Figures of arithmetic in their applications and uses, are more valuable than figures of speech as a mental training. The subject has been carefully considered at some of the statistical congresses, and is deserving of being examined by ourselves, to aid in ridding our science and literature, and our enterprises of all kinds, from much which now overloads them injuriously, by teaching in early life what to do, and what to avoid in dealing with social, economic, philanthropic, and similar questions. In this important work the Statistical Society may greatly aid in the future, for it is at the source that all steps of progress and improvement may be most safely and profitably taken.

As it is, however, it may I think be truly asserted, that in what has already been accomplished for the nation from 1834, the Statistical Society is entitled to claim a large amount of credit, It has only to persevere resolutely in its course to secure at the end

of the next half century of existence an increased degree of solid and well merited praise and success, in educating the country and its rulers on the importance and value of statistical inquiry and research. False guides, like false prophets, only prosper and succeed in times of ignorance and darkness. The light of truth discredits and unmasks them both.

PART IV.

Conclusion.

It has been said that most jubilees need an apology. It may be so when applied to celebrations associated with individuals, or with subjects of local or limited interest. But assuredly none is necessary for the stocktaking of half a century of the work of a Society which has included in its ranks some of the most eminent men of the age, which was instituted to meet an urgent want in social and scientific research; which has met that want in a manner entitled to approval; and which has succeeded in no small degree in influencing legislative and other measures conducing to accuracy, social improvement, and the enlargement of the boundaries of knowledge, in a manner wholly free from passion and prejudice.

In truth, whether statistics be regarded as a mere method, a handmaiden of science, or itself a science, no one now questions their value for deducing and determining the laws which regulate so many things, social, moral, and material, as to be well nigh universal in its application.

The time at which the celebration has fallen is also singularly appropriate for a review of the past, with a view to the successful action of the future.

We in England are in the midst of a social revolution, such as has seldom or never before happened in our history. The centre of political power appears to be shifting, not by violence, revolution, or any of those cataclysms in human affairs which are too often the offspring of unreason, passion, and prejudice, and which destroy with as little regard to reconstruction as the cyclone or the earthquake, or the outburst of pestilence, each of which may, however, have its appointed place and use in the order of nature. The gradual, sensible, and irresistible growth of the

nation in the material elements of prosperity; the rapid progress of science and art in all that relates to human comfort and happiness; the daily and hourly closer intercourse of nations by the agency of steam communication, the post and the telegraph, all tend more and more to bind all people into one great brotherhood, however little manifestation of it may appear on the surface at the present moment. The various conditions of life in association with its attendant good and evil, wealth and prosperity, happiness and misery, all need to be studied with the utmost care and attention to educe from them the laws which will enable us to guide, direct, and control them, in such manner as to lead to the common good of all. This can, I contend, best be done by the application of statistical inquiry and research, and the employment of the numerical method in marshalling the figures collected with scientific accuracy and precision.

This then is my *apologia* for the present imperfect, and I fear incomplete attempt to place on record an outline of the fifty years' work of the Statistical Society of London, and of its influence on the science which it has cultivated, and the nation to which it belongs.

Here I might fitly have terminated my task as to the past. But, I hold one of the great purposes of the Jubilee to be to formulate the future as respects both the Society and the science; a few words on this subject will not, therefore, I hope, be deemed out of place on the present occasion.

The manner in which the Society has heretofore done its work and extended its field of action, as soon as the rapid progress which followed its footsteps showed it to be necessary, has already been told.

Its numbers are at present large, and its zeal undiminished, but the absence of an entrance fee and the lowness of its subscription renders it expedient to increase the members largely to ensure such measure of success in the future, as augmented pecuniary resources can afford.

But this is, in my belief, in no way the most important means to attain the end of increased usefulness, dignity, and importance. I hold that step to be the recognition of statistics by the State not only as an important branch of science, but in the form of one of its sections, political arithmetic, an indispensable ally of state-craft and legislation in both their executive and administrative capacities.

The persevering and nearly successful endeavour of the Society to bring about the federation of several other important associations failed, chiefly, I believe, because it did not go to the root of

the matter. Beyond bringing them under the same roof as a measure of mutual convenience and economy, a most desirable arrangement in itself, it in no way changed their status or improved their position, as members of the great corporation of Modern Science.

The union required is that of one great family in the manner of the union of the branches of the Institute of France, or of the Academy of Science of Berlin, links in the same chain of the pursuit of knowledge tending to the advantage of mankind.

What then stands in the way?

My belief is that it is the charter or charters of the Royal Society, but from no fault of the Society itself, which made an effort to remedy this cardinal defect a few years since, as I shall presently endeavour to show. The basis of this remedy was, I think, unsound, and too narrow fully to accomplish its intention. Hence the need of its further consideration.

When the charters of Charles II were given to our renowned and leading Society they were thoroughly appropriate, and grand and of lasting value has been the work in original research which has been accomplished by it, in pure science and in physical research. But it no longer represents the science of the era of steam and electricity, of which it paved the way.

This was evidently perceived in the Royal Society itself even a century ago, as shown by the institution of the Linnæan Society in 1788, the first instance of a subdivision of scientific labour in the metropolis, by the establishment of a distinct association by Royal Charter. The Geological Society seceded from it in 1807, and the Royal Astronomical Society in 1820. A plan was proposed for consolidating the Geological with the Royal as an assistant society, but was rejected by the former, for reasons which would apply to other important associations, with even greater cogency than influenced the geologists in the beginning of the century.

Regarding the Linnæan Society, its first President, Sir James Smith, remarked: "It is altogether incompatible with the plans "of the Royal Society, engaged as it is in all the branches of "philosophy, to enter into the minutiæ of natural history. Such "an institution as ours, therefore, is absolutely necessary."

The substantial advances made in botany and geology since the secession, have amply justified the step taken.

The last of the historians of the Royal Society, in advocating the erection of a building suitable for a Palace of Science, prior to the occupation of Burlington House, remarks:—*

"But there is more to be gained by such a step than the mere "adornment and dignifying of science. It may be materially

* Weld's "History of the Royal Society," vol. ii, p. 198.

" benefited. The time has passed when the Royal Society stood " alone as the representative of all the sciences. The increase of " population and education naturally resulted in an increase of " scientific men, and as we have seen new associations were formed " for the cultivation of various branches of science, which could " hardly have been done effectually by the limited funds of the " parent society. These new societies, it cannot be denied, have " done much to enrich our stores of knowledge, and enlarge the " realms of science; but there is a weakening tendency in their " very numbers, a frittering away, if we may be allowed the expres- " sion, of valuable time and abilities; societies growing out of " societies, and encumbered with the expensive machinery of apart- " ments and offices, each setting up on a smaller scale what is " often unnecessary as far as the wants and interests of science are " concerned. Indeed, the multiplication of scientific societies in " London must have a certain injurious effect; already the seeker " for information is bewildered by their number, and the discoverer " of a new fact is at a loss where to offer his contribution. To the " pure ambition of starting and presiding over a new society, may " the ramifying nature of our scientific bodies be in a great measure " ascribed. Philosophy can scarcely require so many temples, for " as in art, so in science, there is a bond of fellowship: 'Omnes " 'artes, quæ ad humanitatem pertinent, quoddam commune " 'Vinculum, et quasi cognatum quâdam inter se continentur.' "* And so to solve the difficulties, and get rid of the frittering away " of valuable time and abilities" [of such institutions as the Zoological, Geographical, Statistical, and several such associations of equal importance!] the writer recommends the localising of the libraries of the various societies referred to by him, under the same roof.

The Royal Society can scarcely be held responsible for the above reasoning, either as respects the extension of science, or the creation of new associations for its investigation. The solitary grain of truth contained in it, is the fact that the Royal Society is no longer the sole representative of all the sciences. The " commune " vinculum" of Cicero is not a mere gathering together of books under one roof for facility of reference, and the subdivisions and extensions of science are not due solely to increase of population and education.

No better evidence of the exact position of the Royal Society can be adduced than the enumeration of the papers contained in the "Philosophical Transactions" from 1665-1848, 5,336 in number, as given by the writer referred to.

* Cicero de Rep., ii, 4.

They are :—

Mathematics	285	Geology and mineralogy	384
Astronomy	621	Botany and agriculture	280
Mechanics, hydrostatics, hydraulics, and acoustics	461	Zoology	420
Optics	206	Anatomy, physiology, and medicine	1,020
Chemistry, pneumatics, and meteorology	929	Geography and topography	77
Electricity, galvanism, and magnetism	416	Archæology	117
		Miscellaneous	120

It is perceptible at a glance that they are very far from covering the field of any one of the sciences, except probably pure mathematics, and that they omit others of equal value entirely. Indeed, the rigorous terms of their charters of necessity exclude them.

The Royal Society endeavoured to open its doors wider, and to admit members of distinction unconnected with physical science, and unassociated with their own proper work, such as members of the learned professions generally, persons distinguished as engineers, architects, painters, sculptors, engravers; persons distinguished for literary or archæological attainments, and generally any one attached to science and anxious to promote its progress.

An examination of the list of Fellows of the Royal Society, particularly those elected since the above concessions were made, will show at once to what extent this liberal measure has operated in electing the men the most distinguished in the various walks of life mentioned, and how absolutely insufficient it is, and must be, to attain its object.

It is no derogation to the Royal Society as at present constituted to state that it cannot assume to be a fit judge of merit which it is unable to gauge correctly by any special knowledge of the members of its own body, and that the selection to be of any real value, must be made by those alone fully competent to exercise this power, viz., by the members of the different associations devoted to literary, scientific, or artistic pursuits. The selection at present rests practically with any three Fellows of the Royal Society who can certify to the fitness of the candidate from personal knowledge, and any three others from general repute, a tribunal to which very few of the men who would confer as much distinction upon the fellowship as it could possibly reflect upon them, would care to appeal, even when backed by the careful scrutiny of the Council, to which all such nominations are subjected.

The true solution of the question appears to me to lie in the confederation of the different literary, artistic, and scientific bodies in a single Institute or Academy, leaving open to all, chartered and unchartered, their existing organisations and procedure, their

special methods of research and record, and all the rights and privileges they at present enjoy, but raising all of sufficient weight and importance to the same level as the Royal Society itself, the illustrious parent and predecessor of them all—*primus inter pares*—but no longer the sole arbiter of the intellectual pre-eminence of the most distinguished members of all branches of art, science, and literature, and sole fountain of honour for the blue riband of knowledge, the Fellowship of the Royal Society.

This can be done, I think, by a continuing charter welding them all into one grand Royal Society of Science, Art, and Literature, with strict limitations of granting the Fellowship to each branch, similar to those observed in each of the sections of the French Institute.

To attempt to work out such a scheme would be foreign to my present purpose. That it would be difficult and demand much consideration is undoubted; but I believe it to be perfectly practicable, and that it would connect in one unbroken chain the glorious traditions of the past, with the hope, vigour, intelligence, culture, and promise of the present, and be the harbinger of a future including all parts of the British empire in its embrace, and gathering into its fold all distinguished searchers after truth in the entire domain of human knowledge cultivated by the subjects of Her Most Gracious Majesty in the Victorian Era.

There would be no room in such a scheme for the intervention of the State, except in the granting of the charter, and no inclusion of claims to personal distinction other than are associated with eminence in any of the various branches of knowledge represented by the various learned societies.

In such a confederation, the Statistical Society would occupy no secondary position, for, in the terms in which the illustrious Prince Consort concluded his address to the Statistical Congress in London a quarter of a century since :—

Its mission has been "to lay the solid foundation of an edifice, "necessarily slow of construction, and requiring for generations to "come laborious and persevering exertion, intended as it is for the "promotion of human happiness by leading to the discovery of "those eternal laws upon which that universal happiness is "dependent."

And He, whose pure and gentle spirit was so soon to pass away, to the irreparable loss of all that is great and ennobling in our nature, uttered his farewell in these solemn and touching terms :—

"May He who has implanted in our hearts a craving after the "discovery of TRUTH, and given us reasoning faculties to the end "that we should use them for this discovery, sanctify our efforts "and bless them in their results!"

APPENDIX I.

OFFICERS OF THE SOCIETY.

Four Vice-Presidents were nominated each year from the Members of the Council, by the President.

Date.	Presidents.	Secretaries.	Treasurers.	Editors of Journal.
1834–36	The Marquis of Lansdowne.	W. Greig..... 1834–38 Charles Maclean ..... '34–39 E. C. Tuffnell ..... '34	Henry Hallam.	
'36–38	Sir Charles Lemon, Bart.	J. E. Drinkwater ..... '35 R. W. Rawson ..... '36–42		R. W. Rawson.
'38–40	Earl Fitzwilliam, K.G.	J. Clendenning, M.D. '39–42		
'40–42	The Earl of Harrowby, K.G.	J. Fletcher..... '40–52	G. R. Porter, F.R.S.	Joseph Fletcher.
'42–43	The Marquis of Lansdowne (2).	W. A. Guy, M.D., F.R.S. ..... '43–68 D. Oswald ..... '43–53		
'43–45	The Earl of Shaftesbury, K.G.			
'45–47	Lord Monteagle.			
'47–49	Earl Fitzwilliam (2).			
'49–51	The Earl of Harrowby, K.G. (3).			
'51–53	Lord Overstone.		Benj. Phillips, F.R.S.	Wm. A. Guy, M.D., F.R.S.
'53–55	Earl Fitzwilliam, K.G. (3)	F. G. P. Neison..... 1853 W. Newmarch, F.R.S. '54–62		
'55–57	The Earl of Harrowby, K.G. (3)	W. G. Lumley ..... '54–71	William Farr, M.D., D.C.L., C.B., F.R.S.	W. Newmarch, F.R.S.
'57–59	The Earl of Derby, K.G.			
'59–61	Earl Russell.			
'61–63	Lord Hampton.	F. Purdy..... 1863–73		F. Purdy.
'63–65	Col. W. H. Sykes.			
'65–67	Lord Houghton.			
'67–69	Rt. Hon. W. E. Gladstone, M.P.	W. B. Hodge..... 1863	J. T. Hammick.	
'69–71	William Newmarch, F.R.S.	J. Waley, M.A. ..... '70–72		
'71–73	Wm. Farr, M.D., D.C.L., C.B., F.R.S.	F. J. Mouat, M.D..... '72–75		
'73–75	William A. Guy, F.R.S.	R. Giffen, LL.D. ..... '73–74 H. R. Lack..... '74–76 Hammond Chubb, B.A. '75–83	R. B. Martin, M.A., M.P.	F. J. Mouat, M.D.
'75–77	James Heywood, F.R.S.	R. Giffen ..... '76–81		R. Giffen, LL.D.
'77–79	Rt. Hon. G. J. Shaw-Lefevre, M.P.	Prof. W. S. Jevons ... '77–79		
'79–80	Sir Thomas Brassey, K.C.B., M.P.	J. B. Martin, M.A. ... '80—		
'80–82	Sir J. Caird, K.C.B., F.R.S.	A. E. Bateman..... '82—		
'82–84	Robert Giffen, LL.D.	G. Baden-Powell, C.M.G. ..... '84—		
'84—	Sir Rawson W. Rawson, K.C.M.G., C.B.	*Foreign Secretaries.* F. J. Mouat, M.D. ... 1876–81 J. B. Martin, M.A. ... '80—		

APPENDIX II.

Details of Members, Amount of Subscriptions, Annual Income and Expenditure, Cost, and Sale of Journal.

Year.	Number of Members Elected.			Amount Received from Members.			Number of Members.		Annual Income from all Sources.	Annual Expenditure.	Balance.	Cost of Journal.	Amount Realised by Sale of Journal.
	Ordinary.	Life.	Total.	Annual Subscriptions.	Compounders.	Total.	Died.	Withdrawn.					
				£	£	£			£	£	£	£	£
1834 '35*	349	30	379	1,368	628	1,996	3	29	2,003	1,931	72	—	—
'36....	33	3	36	617	57	674	—	13	989	878	111	—	—
'37....	24	2	26	661	42	703	1	25	738	887	−149	—	—
'38....	62	5	67	722	98	820	—	16	850	794	56	150	—
'39....	33	3	36	758	61	819	1	20	819	849	− 30	196	—
'40....	28	2	30	707	42	749	1	12	793	800	− 7	195	—
'41....	40	3	43	762	63	825	—	18	929	908	21	398	90
'42...	31	—	31	706	—	706	—	20	783	814	− 31	259	15
'43....	24	3	27	743	61	804	2	13	932	901	31	308	75
'44....	17	4	21	678	84	762	1	14	859	788	71	280	72
Totals	641	55	696	7,722	1,136	8,858	9	180	9,695	9,550	145	1,786	252
1845....	24	5	29	701	105	806	—	20	919	1,003	− 84	273	46
'46....	9	1	10	678	21	699	1	10	748	694	54	74	49
'47....	24	4	28	634	82	716	6	14	756	828	− 72	305	38
'48....	26	2	28	612	42	654	3	20	790	769	21	250	54
'49....	25	2	27	602	42	644	5	12	734	764	− 30	280	60
'50....	23	1	24	598	21	619	2	13	703	672	31	206	56
'51....	22	2	25	571	42	613	3	5	692	660	32	215	51
'52....	22	3	25	646	63	709	7	9	808	830	− 22	361	71
'53....	22	5	27	619	105	724	3	17	918	924	− 6	460	91
'54....	19	—	19	593	—	593	5	19	896	890	6	393	197
Totals	217	25	242	6,254	523	6,777	35	139	7,694	8,034	− 70	2,817	713
1855....	39	3	42	636	63	699	11	17	890	932	− 42	331	88
'56....	26	3	29	655	63	718	4	16	840	816	24	266	9
'57...	11	4	22	611	84	695	9	18	869	755	114	271	120
'58....	14	3	17	613	63	676	4	26	824	682	142	286	56
'59....	16	—	16	594	—	594	12	11	729	743	− 14	306	77
'60....	34	—	34	588	—	588	6	8	706	787	− 81	288	68
'61....	12	1	13	602	21	623	10	8	754	744	10	310	74
'62....	34	1	35	615	21	636	14	13	770	763	7	314	79
'63....	15	1	16	605	21	626	10	15	766	669	97	293	88
'64....	31	3	34	596	63	659	10	13	749	903	−154	401	36
Totals	239	19	258	6,115	399	6,514	90	145	7,897	7,794	103	3,066	695

* These figures are for the years 1834 and 1835, the former a broken period, the Society having been constituted in March, 1834, and holding its first annual meeting in April, 1835.

Details of Members, Amount of Subscriptions, Income and Expenditure, &c.—Contd.

Year.	Number of Members Elected.			Amount Received from Members.			Number of Members.		Annual Income from all Sources.	Annual Expenditure.	Balance.	Cost of Journal.	Amount Realised by Sale of Journal.
	Ordinary.	Life.	Total.	Annual Subscriptions.	Compounders.	Total.	Died.	Withdrawn.					
				£	£	£			£	£	£	£	£
1865....	22	4	26	590	84	674	11	7	921	794	127	351	185
'66....	17	1	18	590	21	611	9	8	754	857	−103	351	78
'67....	27	1	28	603	21	624	9	12	778	831	− 53	365	105
'68....	33	1	34	622	21	643	7	11	796	726	70	293	109
'69....	35	2	37	617	42	659	4	10	810	826	− 16	279	103
'70....	24	1	25	670	21	691	7	4	852	839	13	314	112
'71....	42	3	45	657	63	720	9	4	880	804	76	317	115
'72....	31	9	40	739	189	928	7	2	1,112	806	306	318	141
'73....	101	9	110	832	189	1,021	18	16	1,248	1,097	151	384	167
'74....	80	12	92	918	252	1,170	12	7	1,377	1,491	−114	461	140
Totals	412	43	455	6,838	903	7,741	93	81	9,528	9,071	457	3,433	1,255
1875....	45	5	50	928	105	1,033	10	16	1,231	1,733	−502	449	133
'76....	40	8	48	1,054	168	1,222	18	21	1,438	1,340	98	524	159
'77....	99	12	111	1,117	252	1,369	10	20	1,597	1,286	311	474	151
'78....	93	14	107	1,197	294	1,491	11	19	1,732	1,345	387	580	169
'79....	83	6	89	1,300	126	1,426	11	35	1,698	1,427	271	671	176
'80....	60	13	73	1,317	273	1,590	15	29	1,902	1,517	385	573	202
'81....	40	4	44	1,306	84	1,390	18	19	1,649	1,400	249	609	145
'82....	32	9	41	1,291	189	1,480	13	32	1,838	1,581	257	552	227
'83....	107	6	113	1,361	126	1,487	10	23	1,778	1,635	143	585	150
'84....	92	14	106	1,447	294	1,741	17	30	3,280	3,221	59	645	207
Totals	691	91	782	12,318	1,911	14,229	133	244	18,143	16,485	1,658	5,662	1,719

APPENDIX III.

Regulations.

1835.

Number of Fellows and Foreign Members.

1. The number of Fellows shall be unlimited. Foreigners of distinction may be admitted Foreign Members, so that there be not more than fifty Foreign Members at any one time.

Proposal of Fellows.

2. Every Candidate for admission as a Fellow of the Society shall be proposed by two or more Fellows, who, by their certificate that he is a fit person to be admitted a Fellow of the Statistical Society of London, shall certify their personal knowledge of him or of his works. Every such certificate shall be read and suspended in the meeting-room of the Society during an Ordinary Meeting, and shall remain suspended until the following Ordinary Meeting, at which the vote shall be taken upon it.

1884.

Objects of the Society.

1. The Statistical Society was established to collect, arrange, digest, and publish facts illustrating the condition and prospects of society, in its material, social, and moral relations. These facts are for the most part arranged in tabular forms, and in accordance with the principles of the numerical method.

The Society not only collects new materials, but condenses, arranges, and publishes those already existing, whether unpublished or published in diffuse and expensive forms, in the English or in any foreign language.

The Society likewise promotes the discussion of legislative and other public measures from the statistical point of view. These discussions form portions of the Transactions of the Society.

Constitution of the Society.

2. The Society consists of Fellows and Honorary Members, elected in the manner laid down in the following rules.

Number of Fellows and Honorary Members.

3. The number of Fellows shall be unlimited. Foreigners or British subjects of distinction residing abroad may be admitted as Honorary Members: of whom the number shall not be more than seventy at any one time.

Proposal of Fellows.

4. Every Candidate for admission as a Fellow of the Society shall be proposed by two or more Fellows, who shall certify from their personal knowledge of him or of his works, that he is a fit person to be admitted a Fellow of the Statistical Society. Every such certificate having been read and approved at a Meeting of the Council, shall be suspended in the meeting-room of the Society until the following Ordinary Meeting, at which the vote shall be taken upon it.

Regulations—Contd.

1835.

Election of Fellows.

3. In the election of Fellows, the votes shall be taken by ballot. No person shall be admitted unless at least sixteen Fellows vote, and unless he have in his favour three-fourths of the Fellows voting.

Admission of Fellows.

4. Every Fellow elect shall appear for his admission on or before the third Ordinary Meeting of the Society after his election, or within such time as shall be granted by the Council, otherwise his election shall be void.

The manner of admission shall be thus:—

Immediately after the reading of the minutes, the Fellow elect, having first paid his subscription for the current year or composition, shall sign the obligation contained in the Fellowship-book, to the effect following:—

"We who have underwritten our "names, do hereby undertake, each for "himself, that we will endeavour to "further the good of the Statistical "Society of London for improving "Statistical Knowledge, and the ends "for which the same has been founded; "that we will be present at the Meet-"ings of the Society as often as con-"veniently we can, and that we will "keep and fulfil the Rules and Orders "of this Society: provided that when-"soever any one of us shall make "known, by writing under his hand, "to the President for the time being, "that he desireth to withdraw from "the Society, he shall be free thence-"forward from this obligation."

Whereon the President, taking him by the hand, shall say,—"*By the "authority, and in the name of the "Statistical Society of London, I do "admit you a Fellow thereof.*"

Admission of Foreign Members.

5. There shall be Two Meetings in the year, on such days as shall be hereafter fixed by the Council, at which *Foreign Members* may be elected. No

1884.

Election of Fellows.

5. In the election of Fellows, the votes shall be taken by ballot. No person shall be admitted unless at least sixteen Fellows vote, and unless he have in his favour three-fourths of the Fellows voting.

Admission of Fellows.

6. Every Fellow elect shall appear for his admission on or before the third Ordinary Meeting of the Society after his election, or within such time as shall be granted by the Council.

The manner of admission shall be thus:—

Immediately after the reading of the minutes, the Fellow elect, having first paid his subscription for the current year or his composition, shall sign the obligation contained in the Fellowship-book, to the effect following:—

"We, who have underwritten our "names, do hereby undertake, each for "himself, that we will endeavour to "further the good of the Statistical "Society for improving Statistical "Knowledge, and the ends for which "the same has been founded; that we "will be present at the Meetings of the "Society as often as conveniently we "can, and that we will keep and fulfil "the Rules and Orders of this Society: "provided that whensoever any one of "us shall make known, by writing "under his hand, to the President for "the time being, that he desires to "withdraw from the Society, he shall "be free thenceforward from this "obligation."

Whereon the President, taking him by the hand, shall say,—"*By the "authority and in the name of the "Statistical Society I do admit you a "Fellow thereof.*"

Upon their admission Fellows shall have the right of attaching to their names the letters F.S.S.

Admission of Honorary Members.

7. There shall be Two Meetings in the year, on such days as shall be hereafter fixed by the Council, at which *Honorary Members* may be elected.

Regulations—Contd.

1835.

Foreign Member can be recommended but by the Council. Any Member of the Council may propose a Foreigner of distinction at any Meeting of the Council. Notice thereof shall be given to every Member of the Council, and of the day on which the Council will vote by ballot on the question whether they will recommend the person proposed. No such recommendation to the Society shall be unless at least three-fourths of the votes are in favour thereof. Notice of the recommendation shall be given from the chair at the Meeting of the Society next preceding that at which the vote shall be taken thereon. No such recommendation shall be adopted unless at least three-fourths of those voting are favourable.

Payments by Fellows.

6. Every Fellow of the Society shall pay a yearly subscription of *Two Guineas*, or may at any time compound for his future payments by paying at once the sum of Twenty Guineas. No payments are made by Foreign Members.

Defaulters.

7. All yearly payments shall be due on the first day of January in every year. No Fellow shall be entitled to vote at any Meeting of the Society who shall not have paid his subscription due for the year: if the subscription remain unpaid during the space of two years, the name of the defaulter shall be suspended in the ordinary meeting-room of the Society; and if it be not paid on the 15th March of the third year following that on which it ought

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No Honorary Member can be recommended for election but by the Council. Any Member of the Council may propose a Foreigner or British subject of distinction residing abroad at any Meeting of the Council, delivering at the same time a written statement of the qualifications, offices held by, and published works of the person proposed; and ten days' notice at least shall be given to every Member of the Council, of the day on which the Council will vote by ballot on the question whether they will recommend the person proposed. No such recommendation to the Society shall be adopted unless at least three-fourths of the votes are in favour thereof.

Notice of the recommendation shall be given from the chair at the Meeting of the Society next preceding that at which the vote shall be taken thereon. No person shall be elected an Honorary Member unless sixteen Fellows vote and three-fourths of the Fellows voting be in his favour.

The Council shall have power to elect as Honorary Members, the Presidents for the time being of the Statistical Societies of Dublin, Manchester, and Paris, and the President of any other Statistical Society at home or abroad.

Payments by Fellows.

8. Every Fellow of the Society shall pay a yearly subscription of *Two Guineas*, or may at any time compound for his future yearly payments by paying at once the sum of Twenty Guineas.

Defaulters.—Withdrawal of Fellows.

9. All yearly payments are due in advance on the 1st of January, and if any Fellow of the Society have not paid his subscription before the 1st of July, he shall be applied to in writing by the Secretaries, and if the same be not paid before the 1st of January of the second year, a written application shall again be made by the Secretaries, and the Fellow in arrear shall cease to receive the Society's publications, and shall not be entitled to any of the privileges of

Regulations—Contd.

1835.

to have been paid, the defaulter shall cease to be a Fellow of the Society.

Expulsion of Fellows.

8. If any Fellow of the Society, or Foreign Member, shall so demean himself that it shall be for the dishonour of the Society that he longer continue to be a Fellow or Member thereof, the Council shall take the matter into consideration; and if a majority of the whole Council at some Meeting (of which and of the matter in hand such Fellow or Foreign Member, and every Member of the Council, shall have due notice) shall decide by ballot to recommend that such Fellow or Member be expelled from the Society, the President shall at the next Ordinary Meeting announce to the Society the recommendation of the Council, and at the following Meeting the question shall be decided by ballot, and if at least three-fourths of the number voting are in favour of the expulsion, the President shall forthwith cancel the name in the Fellowship-book, and shall say,—

"By the authority and in the name "of the Statistical Society of London, "I do declare that A. B. (naming him) "is no longer a Fellow (or Member) "thereof."

And such Fellow or Foreign Member shall thereupon cease to be of the Society.

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the Society until such arrears are paid; and if the subscription be not discharged before the 1st of February of the second year, the name of the Fellow thus in arrear shall be exhibited as a defaulter on a card suspended in the meeting-rooms; and if, at the next Anniversary Meeting, the amount still remain unpaid, the defaulter shall be announced to be no longer a Fellow of the Society, the reason for the same being at the same time assigned. No Fellow of the Society can withdraw his name from the Society's books, unless all arrears be paid; and no resignation will be deemed valid unless a written notice thereof be communicated to the Secretaries. No Fellow shall be entitled to vote at any Meeting of the Society until he shall have paid his subscription for the current year.

Expulsion of Fellows.

10. If any Fellow of the Society, or any Honorary Member, shall so demean himself that it would be for the dishonour of the Society that he longer continue to be a Fellow or Member thereof, the Council shall take the matter into consideration; and if the majority of the Members of the Council present at some Meeting (of which and of the matter in hand such Fellow or Member, and every Member of the Council, shall have due notice) shall decide by ballot to recommend that such Fellow or Member be expelled from the Society, the President shall at the next Ordinary Meeting announce to the Society the recommendation of the Council, and at the following Meeting the question shall be decided by ballot, and if at least three-fourths of the number voting are in favour of the expulsion, the President shall forthwith cancel the name in the Fellowship-book, and shall say,—

"By the authority and in the name "of the Statistical Society, I do declare "that A. B. (naming him) is no longer "a Fellow (or Honorary Member) "thereof."

And such Fellow or Honorary Member shall thereupon cease to be of the Society.

Regulations—Contd.

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Trustees.

9. The property of the Society shall be vested in *three Trustees*, chosen by the Fellows. The Trustees are eligible to any other office in the Society.

President, Council, and Officers.

10. The business of the Society shall be conducted by a Council, which shall consist of thirty-one Members, including the President. Any five of the Council may act. From the Council may be chosen a *President, four Vice-Presidents*, a *Treasurer*, and *three Secretaries*. Six Fellows, at least, who were not of the Council of the previous year, shall be annually elected.

Committees.

11. The Council shall have power to appoint *Committees of Fellows*, for the examination of particular questions, and to report thereon to the Council. No such report shall be communicated to the Society which is not approved by the Council.

Election of President and Officers.

12. The President shall be chosen yearly by the Fellows; the same person shall not be eligible more than two years in succession. The Vice-Presidents shall be named by the President from the Council for the time being. The Treasurer and Secretaries shall be chosen yearly by the Fellows, but may be continually re-elected.

Election of Council.

13. The Council shall, previously to the Anniversary Meeting, nominate, by

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Trustees.

11 The property of the Society shall be vested in *three Trustees*, chosen by the Fellows. The Trustees are eligible to any other offices in the Society.

President, Council, and Officers.

12. The Council shall, besides the Honorary Vice-Presidents and the Trustees, consist of thirty-one Members, of whom one shall be the President, and four be nominated Vice-Presidents. The Council shall be elected as hereafter provided. Any five of the Council shall be a quorum. From the Council shall be chosen a *Treasurer, three Secretaries*, and a *Foreign Secretary*, who may be one of the Secretaries. Six Fellows, at least, who were not of the Council of the previous year, shall be annually elected.

Committees.

16. The Council shall have power to appoint *Committees of Fellows* and also an Executive Committee of their own body. The Committees shall report their proceedings to the Council. No report shall be communicated to the Society which is not approved by the Council.

Election of President and Officers.

13. The President shall be chosen yearly by the Fellows. The same person shall not be eligible more than two years in succession.

The former Presidents who are continuing Fellows of the Society shall be Honorary Vice-Presidents; four Vice-Presidents shall be yearly chosen from the Council by the President.

Any Honorary Vice-President may take part in the deliberations of the Council on expressing a wish to that effect: and when attending the Meetings of the Council, shall exercise all the rights and powers of a Member of the Council.

The Treasurer and Secretaries shall be chosen yearly by the Fellows from the Council.

Election of Council.

14. The Council shall, previously to the Anniversary Meeting, nominate, by

Regulations—Contd.

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ballot, the *Fellows whom they recommend* to be the next President and Council of the Society. They shall also recommend a Treasurer and Secretaries. Notice shall be sent to every Fellow whose residence is known, within the limits of the threepenny post, at least a fortnight before the Anniversary Meeting, of the names on the list which the Council will recommend.

Extraordinary Vacancies.

14. On any *extraordinary vacancy* of the Office of the President, or other Officer of the Society, or in the Council, one of the Secretaries shall summon the Council with as little delay as possible, and a majority of the Council, thereupon meeting in their usual place, shall, by ballot and by a majority of those present, choose a new President or other Officer of the Society, or Member of the Council, to be so until the next Anniversary Meeting.

Meetings Ordinary and Anniversary.

15. The *Ordinary Meetings* of the Society shall be monthly during the Session, which shall be from the 1st of November to the 1st of July, both inclusive, on such day and at such hour as the Council shall declare at the previous Anniversary Meeting. The *Anniversary Meeting* shall be on the 15th March in every year, or on the following day if the 15th March fall on a Sunday.

Business of Ordinary Meetings.

16. The business of the *Ordinary Meetings* shall be to admit Fellows, to read and hear reports, letters, and papers on subjects interesting to the Society. Nothing relating to the rules or management of the Society shall be discussed at the Ordinary Meetings, except that the *Auditors' Report* shall be received at the Ordinary Meeting in *February*, and that the Minutes of the Anniversary Meeting, and of every Special General Meeting, shall be confirmed at the next Ordinary Meeting after the day of such Anniversary or

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ballot, the *Fellows whom they recommend* to be the next President and Council of the Society. They shall also recommend for election a Treasurer and Secretaries (in accordance with Rule 12). Notice shall be sent to every Fellow whose residence is known to be within the limits of the metropolitan post, at least a fortnight before the Anniversary Meeting, of the names of Fellows recommended by the Council.

Extraordinary Vacancies.

15. On any *extraordinary vacancy* of the Office of the President, or other Officer of the Society, or in the Council, the Secretaries shall summon the Council with as little delay as possible, and a majority of the Council, thereupon meeting in their usual place, shall, by ballot, and by a majority of those present, choose a new President, or other Officer of the Society, or Member of the Council, to be so until the next Anniversary Meeting.

Meetings Ordinary and Anniversary.

17. The *Ordinary Meetings* of the Society shall be monthly, or oftener, during the Session, which shall be from the 1st of November to the 1st of July, both inclusive, on such days and at such hours as the Council shall declare. The *Anniversary Meeting* shall be held on such day in June of each year as shall be appointed by the Council for the time being.

Business of Ordinary Meetings.

18. The business of the *Ordinary Meetings* shall be to admit Fellows, to read and hear reports, letters, and papers on subjects interesting to the Society. Nothing relating to the rules or management of the Society shall be discussed at the Ordinary Meetings, except that the *Auditors' Report* shall be received at the Ordinary Meeting in *February*, and that the Minutes of the Anniversary Meeting, and of every Special General Meeting, shall be confirmed at the next Ordinary Meeting after the day of such Anniversary or

Regulations—Contd.

1835.

Special General Meeting. *Strangers* may be introduced to the Ordinary Meetings, by any Fellow, with the leave of the President, Vice-President, or other Fellow presiding at the Meeting.

Business of Anniversary Meetings.

17. The business of the *Anniversary Meeting* shall be to elect the Officers of the Society, and to discuss questions on its rules and management. No Fellow or Foreign Members shall be proposed or admitted at the Anniversary Meeting. No Fellow shall moot any question on the rules or management of the Society at the Anniversary Meeting unless after *fourteen days' notice* thereof given to the Council, but amendments to any motion may be brought forward without notice, so that they relate to the same subject of motion.

Special General Meeting.

18. The Council may, at any time, call a *Special General Meeting* of the Society when it appears to them necessary. Any ten Fellows may require a Special General Meeting to be called, by notice in writing signed by them, delivered to one of the Secretaries at an Ordinary Meeting, specifying the questions to be moved. The Council shall, within one week of such notice, appoint a day for such Special General Meeting, and shall give one week's notice of every Special General Meeting, and of the questions to be moved, to every Fellow within the limits of the threepenny post, whose residence is known. No business shall be brought forward at any Special General Meeting other than that specified in the notice for the same.

Auditors.

19. At the *first Ordinary Meeting* of each year, the Fellows shall choose two *Auditors*, not of the Council, who, with one of the Council, chosen by the Council, shall audit the Treasurer's accounts, and report thereon to the Society, which report shall be presented

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Special General Meeting. *Strangers* may be introduced to the Ordinary Meetings, by any Fellow, with the leave of the President, Vice-President, or other Fellow presiding at the Meeting.

Business of Anniversary Meetings.

19. The business of the *Anniversary Meeting* shall be to elect the Officers of the Society, and to discuss questions on its rules and management. No Fellows or Honorary Members shall be proposed or admitted at the Anniversary Meeting. No Fellow shall moot any question on the rules or management of the Society at the Anniversary Meeting, unless after *three weeks' notice* thereof given to the Council, but amendments to any motion may be brought forward without notice, so that they relate to the same subject of motion. The Council shall give fourteen days' notice to every Fellow of all questions of which such notice shall have been given to them.

Special General Meetings.

20. The Council may, at any time, call a *Special General Meeting* of the Society when it appears to them necessary. Any ten Fellows may require a Special General Meeting to be called, by notice in writing signed by them, delivered to one of the Secretaries at an Ordinary Meeting, specifying the questions to be moved. The Council shall, within one week of such notice, appoint a day for such Special General Meeting, and shall give one week's notice of every Special General Meeting, and of the qnestions to be moved, to every Fellow within the limits of the metropolitan post, whose residence is known. No business shall be brought forward at any Special General Meeting other than that specified in the notice for the same.

Auditors.

21. At the *first Ordinary Meeting* of each year, the Fellows shall choose two *Auditors*, not of the Council, who, with one of the Council, chosen by the Council, shall audit the Treasurer's accounts, and report thereon to the Society, which report shall be presented

Regulations—Contd.

1835.

at the Ordinary Meeting in February. The Auditors shall be empowered to examine into the particulars of all expenditure of the funds of the Society where they shall see occasion, and may report their opinion upon any part of it.

Duties of the President.

20. The *President* shall preside at all Meetings of the Society, Council, and Committees which he shall attend, and in case of an equality of votes, shall have a second or casting vote. He shall sign all diplomas of admission of Foreign Members. He shall admit and expel Fellows according to the rules of the Society.

Duties of the Treasurer.

21. The *Treasurer* shall receive all monies due to, and pay all monies due from the Society, and shall keep an account of his receipts and payments. No sum exceeding Ten Pounds shall be paid but by order of the Council, excepting always any lawful demand for rates or taxes. He shall invest the monies of the Sociery in such manner as the Council shall from time to time direct.

Duties of the Secretaries.

22. The *Secretaries* shall, under the control of the Council, conduct the correspondence of the Society and Council, and shall have the care of duly recording the Minutes of the Proceedings. They shall issue the requisite notices, and read such papers to the Society as the Council may direct.

Powers of the Vice-Presidents.

23. A *Vice-President* in the chair shall act with the power of the President in presiding and voting at any Meeting of the Society or Council, and in admitting Fellows; but no Vice-President shall be empowered to sign diplomas of admission of Foreign Members, or to expel Fellows. In the absence of the President and Vice-Presidents, any Fellow of the Society may be called to preside at any Ordinary Meeting, but shall not be

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at the Ordinary Meeting in February. The Auditors shall be empowered to examine into the particulars of all expenditure of the funds of the Society where they shall see occasion, and may report their opinion upon any part of it.

Duties of the President.

22. The *President* shall preside at all Meetings of the Society, Council, and Committees, which he shall attend, and in case of an equality of votes, shall have a second or casting vote. He shall sign all diplomas of admission of Honorary Members. He shall admit and expel Fellows and Honorary Members, according to the rules of the Society.

Duties of the Treasurer.

23. The *Treasurer* shall receive all moneys due to, and pay all moneys due from, the Society, and shall keep an account of his receipts and payments. No sum exceeding Ten Pounds shall be paid but by order of the Council, excepting always any lawful demand for rates or taxes. He shall invest the moneys of the Society in such manner as the Council shall from time to time direct.

Duties of the Secretaries.

24. The *Secretaries* shall, under the control of the Council, conduct the correspondence of the Society; they or one of them shall attend all Meetings of the Society and Council, and shall have the care of duly recording the Minutes of the Proceedings. They shall issue the requisite notices, and read such papers to the Society as the Council may direct.

Powers of the Vice-Presidents.

25. A *Vice-President,* whether Honorary or nominated, in the chair, shall act with the power of the President in presiding and voting at any Meeting of the Society or Council, and in admitting Fellows; but no Vice-President shall be empowered to sign diplomas of admission of Honorary Members, or to expel Fellows. In the absence of the President and Vice-Presidents, any Fellow of the Society may be called upon by the

Regulations—Contd.

1835.

empowered to admit Fellows, or to act otherwise as President.

Powers of the Council.

24. All communications to the Society are the property of the Society. The Council shall have control over the papers and funds of the Society, and may, as they shall see fit, direct the publication of papers and the expenditure of the funds, so, nevertheless, that they shall not at any time contract engagements on the part of the Society beyond the amount of the balance that would be at that time in the Treasurer's hands, if all pre-existing debts and liabilities had been satisfied.

25. The Council shall be empowered at any time to frame regulations not inconsistent with these rules, which shall be and remain in force until the next Anniversary Meeting, at which they shall be either affirmed or annulled; but no Council shall have power to renew regulations which have been once disapproved at an Anniversary Meeting.

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Fellows then present, to preside at an Ordinary Meeting. The Fellow so presiding may admit Fellows, but shall not be empowered to act otherwise as President, or Vice-President.

Powers of the Council.

26. The Council shall have control over the papers and funds of the Society, and may, as they shall see fit, direct the publication of papers and the expenditure of the funds, so that they shall not at any time contract engagements on the part of the Society beyond the amount of the balance that would be at that time in the Treasurer's hands, if all pre-existing debts and liabilities had been satisfied.

27. The Council shall be empowered at any time to frame *Regulations* not inconsistent with these rules, which shall be, and remain in force until the next Anniversary Meeting, at which they shall be either affirmed or annulled; but no Council shall have power to renew Regulations which have once been disapproved at an Anniversary Meeting.

28. No Dividend, Gift, Division, of Bonus in money shall be made by the Society, unto or between any of the Fellows or Members, except as hereinafter provided.

29. The Council shall publish a Journal of the Transactions of the Society, and such other Statistical Publications as they may determine upon, and may from time to time pay such sums to Editors and their assistants, whether Fellows of the Society or not, as may be deemed advisable.

30. All communications to the Society are the property of the Society, unless the Council allow the right of property to be specially reserved by the Contributors.

For Appendix IV see p. 359.

Statistical Development, *with* Special Reference *to* Statistics *as a* Science.

By William A. Guy, M.B., F.R.S., &c.

[Read by Major Craigie.]

The application of figures of arithmetic to "the condition and "prospects of society," dates from those early times when families first clustered together and grew into tribes, and tribes into nations; when cities and fortified places came into existence; and men, impelled by very natural motives, took to measuring their wealth and strength. This they did by counting their tents, their herds and flocks, their camels, horses, cattle, sheep, goats, and slaves; their warriors, arms, and war chariots; their money and articles of barter. They even travelled so far on the road to development as to take censuses of their populations, and to make muster-rolls of their fighting men; and they were precise in their statements of the number of victims by their plagues and pestilences.

Thus (to take a few early examples of numeration from the Bible) Abimelech gave, in addition to several presents in kind, a thousand pieces of silver; Abraham had 318 men born in his own household trained to arms; the men of Bethshemish lost 50,007 men by the bubonic plague, which had for concomitant a plague of mice; the children of Israel sojourned in Egypt four hundred and thirty years; and quitted it 600,000 men on foot. The losses in battle suffered or inflicted are also repeatedly stated with precision in figures. It is worthy of remark that though some of these statements are couched in round numbers (as when Joshua is alleged to have crossed the Jordan to the attack of Jericho with *about* 40,000 men), the members of Abraham's household or settlement, and the victims of the plague at Bethshemish are given in minute detail.

That the Jews took censuses of their whole population, or of parts of it, is a noteworthy fact, seeing that here in England the first complete census dates only since the first year of this century.

Give what name we will to this early use of figures as applied to the social life of men in remote ages, it is certainly worth remarking that long before the dawn of any of the physical sciences in which arithmetic now plays so large and so important a part, much that now enters into the composition of statistics, sociology, or social science was in existence. Hence we may assert

without fear of contradiction that the earliest use of numbers consisted in their application to the affairs of daily life; to "the "condition and prospects of society," the aim and object of statistics, the function of our Society; and we may add that when the men who lived in those early times passed from general and often loose statements of numbers to the more exact enumeration of the census, they achieved the highest statistical development of which they were capable.

We, their successors at a long interval of time, made our first development in the same direction when we arranged to take not a single detached census, but a series of censuses at the fixed interval of ten years, thereby introducing the important element of comparison, and a frequently recurring series of standards embracing the smallest no less than the largest aggregates of human beings, hamlets and villages, towns and cities, the metropolis, the main divisions of the kingdom and the United Kingdom itself: standards by which to measure almost every phenomenon of our social life.

Let us hope that this, the first development in this direction, will be promptly followed up by an annual, or, better still, a half-yearly census on given days in the two most strongly contrasted seasons of the year (height of summer and depth of winter), such censuses to embrace all the inmates of our workhouses, prisons, lunatic, idiot, and imbecile asylums, institutions for the blind, deaf and dumb, almshouses, and hospitals; in a word, the whole dependent and dangerous population. Thus we should be kept informed, at short and regular intervals of time, of that which is of the utmost importance for a civilised community to understand, the ups and downs, the fluctuations from half year to half year of that large section of the community which is so costly a burden to those who are classed among the rich, and indirectly to those who are rightly characterised as the poor. This would be a statistical development to be set down as rightly belonging in a very special manner to the "condition and prospects of society."

The fluctuations in this great mixed class of the dangerous and dependent elements of our population being thus ascertained, we should be in a condition to test the ignorant and rash statements of the press and platform, and so to extend the sphere of those periodical reports which have conferred on society the inestimable benefit of accurate knowledge.

Of new forms of insurance, being developments of the general principle, I may mention the insurance against accidents and against sickness, in which our great industrial population has so vital an interest.

I ought perhaps to state that we in England were very far from taking the lead in these important applications of statistics; for

whereas we began to be busy in this direction about the middle of the sixteenth century (1560), Italy practised this civilising art of insurance as early as the end of the twelfth century; and perhaps I may add, as showing that, in many things belonging to what is generally understood by civilisation, we here in England do not so much lay claim to originality as to the persevering development of arts of which other nations have set the examples, how at different times we have taken lessons in manufacture, agriculture, and horticulture, from Holland, as well as that better management of the poor of which she has always offered us an encouraging example.

Leaving now all comparisons of early and modern enumerations as instances of statistical development, I pass on to consider briefly certain developments of more recent date which have taken place within the limits of the United Kingdom; for to these limits I wish it to be understood I restrict myself.

The London Bills of Mortality were first compiled in the reign of Henry VIII (about 1538), but were resumed in 1603, when the plague of that year gave the same wholesome impulse to accurate information which the first invasion of cholera in 1831 did in times nearer to our own. It was in 1837 that the registration of births, deaths, and marriages was set on foot, and in 1840 that it was first brought to a practical bearing. At first limited to England and Wales, as so many of our enumerations still are, it embraced the whole of the United Kingdom in 1865. The facts thus collected, so minute yet so comprehensive, taken in conjunction with those of the decennial censuses, have enabled us not only to compare one population with another, but have also supplied the materials by which, through various combinations and permutations, we have been enabled to establish those general principles which constitute the very essence of *science* as distinguished from *art*.

With what immense consequences, as bearing on "the condition "and prospects of society," these precise data have superseded the scanty and imperfect knowledge of our ancestors it is needless to state. How they have contributed to develop a science of statistics I shall presently attempt to show. But I will observe in passing the great and important developments which have taken place in virtue of statistical researches in the insurance first of property and then of life. How largely this important branch of applied statistics has developed itself in the last two hundred years, since the establishment of the "Hand in Hand" Fire Office in 1696, followed ten years later (1706) by the Amicable Life Office, and these in their turn by the first marine insurance companies of "the Royal Exchange" and "the London" in 1720, it is hardly necessary that I should remind you; or how, later in the last

century, the facts relating to the populations of Northampton and Carlisle (1771 and 1779) were made the basis of the life tables known among us as the Northampton and Carlisle, by Price and Milne (*circa* 1783 and 1797).

Education and crime, teaching, religious and secular, literary and technical; post office reforms and extensions; growing facilities of intercommunication between man and man, nation and nation by canal, road, railroad, ships (sailing and steam); quick communication in all directions by sea and land, through telegraph and telephone; electricity as a common source of light, heat, and mechanical force; steel everywhere superseding iron, as iron had superseded wood; interchange of imports and exports of the most unexpected kind, and by agencies equally unexpected; emigration and immigration on a gigantic scale—these and many other innovations recent and rapid are but instances out of many developments of invention and practical skill, offspring of knowledge ever enlarging its scope, ever attaining to greater and greater exactness. In these numerous and varied applications of intelligence and power we recognise a universal tendency to growth and development, of which as affecting "the condition and prospects of "society," I shall have something more to say presently. Meanwhile I will content myself with illustrating by a single example what half a century of growth and development may bring to pass. I speak of the discovery and progressive growth and improvement of the art and science of photography, with its practical applications to things terrestrial and celestial still unexhausted.

But all this, and more that I might have set forth in this paper must be regarded in the light of an introduction to the topic which I have specially indicated in the title of the paper itself—I mean *Statistics as a Science.*

It is now twenty years since I first mooted in the pages of our *Journal* this question whether Statistics might be considered as a science. I then thought, and still think, that it may be rightly answered in the affirmative.

I may premise that statistics are exposed to difficulties from which other branches of knowledge, universally recognised as sciences, are free. Astronomy, geology, geography, and the like, carry their own meaning with them. The terms are compounded of Greek words with which we have been familiar from our schoolboy days, and we have come to appreciate the meaning of such derivates from the Arabic as Chemistry and Algebra. But not so with the word Statistics. In the hands of Achenwall its inventor, it meant a survey of the customs, laws, and form of government by which one nation, in his day, differed from another. It was history divested of what were for him its least interesting details, such as

the names of monarchs and dynasties, and the issues of wars; in fact, a survey of the complicated conditions which gave each State its character and peculiarities. In periods antecedent to the foundation of our Society, the original meaning of the word was constantly recurring in the shape of statistical surveys, &c. But for us it came to mean collections of figures of equal or similar units applicable to "the condition and prospects of society"—the condition as the result of observation, the prospects as matters of inference.

How the Statistical Society, on its first establishment, denied itself the twofold function of origination of subject and interpretation of results, and how, in course of time, we vindicated to ourselves the liberty which other societies had always enjoyed—this form of statistical development has been fully described by my esteemed friend Dr. Mouat. For other illustrations of statistical development we may look with confidence to the communications promised by the foreign visitors who have honoured our Jubilee with their presence.

If Statistics are to be accounted a science, it must be in a sense differing widely from the more strict acceptation of the term. Science means knowledge, but not *all* knowledge. The knowledge must not be trivial or debasing; the very word implies a certain elevation and dignity. We do not apply it to such arts as that of the tailor, the dressmaker, or the cook. These are of the utmost importance to society, but they lack dignity, and are not governed by any general principles which in other departments of knowledge direct and govern the art itself, and so raise it to the importance of a science. The same may be said to be true of the fine arts generally, with the exception perhaps of architecture, which rests primarily upon the principles of construction, and music, which is to so large an extent a matter of figures and scientific principles.

Again, Statistics have no analogy with that great group of sciences of which astronomy is the chief, which may be fitly styled sciences of mensuration, dealing not with the compound and complex properties of matter, but only with its relations. Nor have they any analogy with that other grand group of sciences, which may be termed sciences of identification; such as botany, and the sciences of observation, which constitute collectively what we term "Natural History." With chemistry, also, as the great science of experiment, and of identification through experiment, Statistics have, if possible still less analogy. If Statistics is to establish its claim to the name of science, it must be by its analogy with such branches of knowledge as physiology and medicine, both of which receive their title of honour for mixed reasons, their acknowledged importance, and the possession on the part of

physiology of two grand central theories (that of the circulation of the blood, and of the true functions of the nervous system), which medicine, with other certain well ascertained facts and principles, also claims. The same remark, with slight modification, applies to such branches of knowledge as agriculture, horticulture, and meteorology. It is with such sciences as these that statistics may be said to claim affinity.

But between Statistics and all other sciences without exception, there is this broad line of separation. Other sciences deal with matters that are not of man's making, and over which he can exercise few or no modifying influences. The astronomer discovers a new planet, and adds it to the existing number, without in any way affecting its character; the botanist discovers a new plant, and at once relegates it to the group to which it belongs, under the artificial or the natural system. But in the case of Statistics we are dealing with a mixed mass of facts brought about in part only by nature herself, but largely influenced by every change of custom, every constitutional reform, every freak of legislation. Peace and war, new fields of enterprise, new openings for trade, freedom and restriction, profoundly modify "the condition and prospects of "society;" and every nation has its own peculiarities, its own combination of facts.

Such being the exceptional character of Statistics, let us now inquire to what group of sciences it is most nearly allied, and through what common feature or features it is connected with them. I again select as the branch of knowledge which bears the nearest resemblance to it one which is largely founded on observation, but which also makes much use of figures; one which is never spoken of otherwise than as a science, never as a mere art. I mean physiology. I have mentioned it as a department of knowledge raised to the dignity of a science by the possession of two grand central truths—the circulation of the blood, and the functions of the nervous system.

I may observe in passing that the earlier discovery of the two (the circulation of the blood) was suggested to Harvey's mind by simple facts expressed in figures, and by a subtle process of reasoning (the *reductio ad absurdum*) converted into an argument little short of demonstration.

Harvey has gauged the left ventricle of the human heart, and finds that it would hold more than two ounces of blood. For this quantity of two ounces he substitutes a sixteenth part, or one drachm. He then reckons the beats of the heart at 2,000 in half an hour, and says that the heart sends forth, in that half hour, more blood than the whole body contains. He makes a similar calculation for the sheep or dog, assumes a scruple of blood to pass

with each beat, reckons what would pass in half an hour at three and a half pounds, which approaches within half a pound all the blood which the body of the sheep contains.

Harvey then meets the objection that the blood derived from the food might traverse the body in the guise of some abundant secretion, such as milk, by first measuring the quantity of milk which an animal will yield in twenty-four hours, adding that, by computation, the heart sends forth as much or more blood in an hour or two. I shall have occasion to refer to this as an example of the logical method of *reductio ad absurdum*, when I enter into the subject of logical methods.

The facts of Statistics may be said to occupy a position intermediate between the universal science of mathematics, including arithmetic, and that other universal science known as logic. The Numerical Method—the name long since given to that portion of the mathematics which prescribes rules for collecting and classifying simple and compound units when gathered into masses; which weighs and tests their relative values as based upon more or fewer facts; and then follows them, so to speak, till they appear in numerical expressions, such as percentages and ratios, allowing of strict comparison with other groups—this method having prepared the way for the work of comparison, that other universal method of logic steps in to suggest sound inferences from these numerical data, treating them not otherwise than it does single facts, or simple results of observation and experiment, or the abstract propositions of Euclid—Harvey's *reductio ad absurdum* does not differ in principle from similar procedures to be found in the pages of the great Greek mathematician.

Statistics then, occupying, as indeed do all these partial sciences, an intermediate position between the two universal methods of arithmetic and logic, may be said to partake of the scientific character of both; resting its claim to be ranked among the sciences on the extent to which it avails itself of their services. The universal science of arithmetic prescribing its rules of procedure under the name of the numerical method, and the universal science of logic dealing with statistical data as with single facts belonging to other branches of knowledge.

The claim of Statistics to be ranked among the sciences may be said to rest on the character impressed upon the labours of such men as Quetelet, Louis, and Gavaret, Guerry and others, whose merits, as scientific men, I leave to be pointed out by their own countrymen who have undertaken to make contributions to our proceedings. Of our English contributions, suffice it to say that we have had among us those who have always worked in the scientific spirit, and resorted freely to that graphic method of

which M. Guerry made such able use. To justify this statement I have but to mention such honoured names as William Farr and Newmarch, among the many who have enriched our *Journal* with their contributions. Nor should I be doing justice to ourselves did I omit a passing notice of the works of William Playfair of Dundee, who made such early, free, and skilful use of the graphic method in his statistical, historical, and political works published towards the end of the last century and beginning of this—to be more exact, between the years 1786 and 1805. This graphic method, which owes so much to M. Guerry and William Playfair, has been largely used here in England by Dr. Farr, in the shape of curves, columns, rectangular and circular forms.

Statistics, thus armed with its facts, and appealing thus forcibly to that sense of sight which is recognised as so important an aid to conception and memory, has made a progress which, half a century ago, could not have been anticipated.

How shall we sufficiently acknowledge the great and unique services of Dr. William Farr, in following up the work of Quetelet by his method and in his spirit? He it was who organised and brought to a practical bearing the work of registration to which we owe so much. How admirably qualified he was to organise the collection and arrangement of his facts; how thoroughly equipped with all the knowledge necessary for the accomplishment of his great task we all know. How the very spirit of science dwelt in him; how kind and courteous he was, how ready to help all who applied to him for counsel there is no one in this meeting who is ignorant. I feel convinced that, though it is as an Englishman that I praise one of the oldest of my friends, and the brightest ornament of our Society, I know that our continental neighbours and friends will fully sympathise in this poor tribute of praise; and not forgetting the claims of their own countrymen, join in acknowledgment of the eminent services of one so justly endeared to us.

I can imagine a man occupying his unique position resting satisfied with the performance of the routine duties of his office—thoroughly efficient, but not original; industrious, yet not stepping beyond the obvious duties which lay in his path: a man so conducting himself would have been held in honour; how much more deserving of praise must he be who, having done all this, was never tired of grasping the great scientific problems which statistics present, and converting them by rare industry and intelligence into scientific truths. Under his hands the facts relating to density of population and to overcrowding were shaped into the general principles that these bear to disease and death, the relation of cause and effect.

Here I may perhaps be allowed to refer to certain early sanitary

inquiries by which I succeeded in giving extension to this principle, by showing that what is true of the surface over which men are distributed, is true also of the habitations, shops, and workshops in which they live and toil. I allude especially to that early inquiry among the letterpress printers; through which I was able to prove that other things being equal, *pulmonary consumption* bore to *space* the inverse relation of cause and effect, and that the advent of consumption was hastened or retarded by sedentary occupation within doors, as contrasted with employment necessitating more or less of muscular effort. Let me also hope to be forgiven if I allude to another statistical inquiry by which I showed that those classes of men exposed to the temptation to drink all lost several years of their lives when compared with other classes less exposed to it.

Had time permitted, I should like to have presented to the meeting a more methodical view of the claims of Statistics to be treated as a science, arising out of the skill with which its votaries have developed and applied the leading principles that dominate all its inquiries. This I would have done under distinct headings:—

1. Principles relating to the identification, collection, and arrangement of the units, whether simple or compound, which by addition of unit to unit constitute the aggregate facts of Statistics. Under this head provision is made for the distinction of units bearing the same name, but yet differing; as when among printers we separate the letterpress printers, and among letterpress printers compositors, pressmen, and enginemen; among soldiers when we are dealing with their death-rate, distinguishing cavalry, artillery, engineers, and rank and file; among criminals the casual and habitual; among crimes the violent, the fraudulent and mixed; among hospital patients sexes, and ages.

2. Principles by which we test the sufficiency or insufficiency of the number of available facts to furnish a true average return, ratio, or percentage; and the value to be attached to these when based upon a smaller number of facts; as also the use to be made of maxima and minima, and the extremes within which numerical results based upon small numbers of facts may be taken to represent the truth. As examples of *maxima* and *minima* applied to the discovery of truths of practical importance, those inquiries by which I was able to condemn the *Static Lung Tests*, so long and so unwisely relied upon as indications of live birth, or the reverse.

3. Principles of the graphic method of representation, by which we construct curves and figures of various forms, shades, and colours and depths of shade and colour, representing numbers by such figures as triangles, squares, oblongs, columns, and circles divided into equal parts, a form of illustration much resorted to by Dr. Farr;

these forms being used to give a definite shape to our conception of figures, and perchance to suggest inquiries and comparisons.

4. Preliminary corrections by which we prepare the way for careful and just comparisons: as when, wishing to learn why it is that admissions into our prisons are more numerous in one month than another, we find that the figures of the returns from which our inferences must be drawn relate to such variable dates as the first *Monday* in each month, not to the first *Day*, and must therefore enter into calculations which shall issue in making the twelve months of equal length; and on the supposition that we find the months of maximum admission to be also months of highest temperature, whether a certain connection of crime and temperature is to be inferred, or that the months of higher temperature are those which favour popular gatherings and excitements. Perhaps in the course of an inquiry of this order we may find that we are dealing with periodical returns first made for a period of years, in summer, but after a certain date in winter, and hence not allowing of just comparison and true inference.

5. Diligent search to be made for cases in which the leading principle, or principles of the logic of observation and experiment admit of application to the discovery of truth; as when in the case of prisoners who live under the same conditions, and have the same diet and supply of water all the year round, attacks of diarrhœa, so often and so incorrectly ascribed to fruit, vary in frequency with the temperature and with that only. Here we resort to the sound logical method of comparing groups of facts, which being equal in all other respects, bring into distinct relief the two concurrent elements of temperature and diarrhœa, and connect them as cause and effect. Or, we may deal with a case in which two concurrent events present a strict relation between two such facts as an improving water supply, and some disease or diseases which decrease and ultimately disappear as the water supply passes from impurity to purity; as happened at Millbank Prison in the matter of dysentery and diarrhœa, and among the juvenile inmates of Christ's Hospital in the instances of diseases of the scalp and ophthalmia. Or again, we may encounter that coincidence of case with case, consisting in the drinking of the water from a certain source with an attack of cholera, as occurred among those who drew their supply of water from the Soho pump, the coincidence in question extending, as it did, to two persons residing far beyond the limits of the parish, but drawing all the water they drank at short intervals from this impure source. By first suspecting this coincidence, and then carefully verifying it by diligent inquiry, Dr. Snow made that grand discovery which has developed itself by the skilful use of the same logical method in the discovery of the frequent relation of

cause and effect between diseases, such as enteric and scarlet fever, and the drinking of tainted milk. It is by discoveries such as these that the original self-denying ordinance of the Statistical Society has been repeatedly condemned.

6. To make diligent search for new facts in corroboration of those already ascertained, no less than of facts which run counter to those first observed. I insist on this precaution, because I think that had it been attended to in the case of a certain remarkable observation of Quetelet, he would have been led to the discovery of the great central truth that the aggregate figures of Statistics in which society is most interested, are subject to fluctuations which, small in certain exceptional cases, are large in certain others, and have a wide range between a high maximum and a low minimum of intensity.

Quetelet was much disquieted by finding that, on comparing the "physical world" and the "social system" it is hard to decide which of the two displays most "regularity." He did not take the precaution of rectifying the figures which had so much moved him by others of a like order. Had he done so, he would have established the comfortable truth that each order of social facts, as established by numerical returns, is subject to its own rule of periodical fluctuation, in lieu of the narrow inference which had so greatly disquieted him.

The facts of this special case are so instructive that I cannot resist the temptation of setting them forth in an appendix to this communication. In it are set forth the results of an inquiry suggested and stimulated by the despondency-producing figures of Quetelet; and I take them to supply a fitting answer to the theories relating to Free Will and Necessity which Buckle and others of the like mode of thinking have founded upon them. May I indulge the hope that my method, and the figures which result from its application, will be accepted by my own countrymen, and by those friends from abroad who honour us with their company to-day, as at least a sound starting point of a more comprehensive inquiry into the great central question of periodical fluctuation in the facts which are the objects of our study? Making every allowance for the number of facts from which our average results are drawn, I trust that what I have had occasion to say will strengthen the impression which a careful study of human affairs produces, that the numerical results of our industry in collecting facts, and our skill in using them demonstrate both the variety and variable force of the agencies amid which our "little life" is spent.

Taking disease as the condition with which, alas! we are most familiar, we discern the awful power that resides in atmospheric influences to determine the ever changing prevalence of the fatal

maladies which constantly assault us with arrows sharp and swift, and contrast these zymotic influences with the causes which gradually undermine our strength and vigour. These arrows of Apollo, now darting through the air in isolated groups, now darkening the atmosphere with thick showers, assert for themselves numerical preeminence as agents of death. Compared with causes slowly acting within the body itself they are the very types of excessive fluctuation. These figures, samples of others allied to them supplied by such agencies as crimes, habits of life, and acts of deliberation, convert our aggregate social life into a perplexed and tangled skein, hard indeed to unravel, but destined to yield in part to patient manipulations. These our perplexities are in gradual course of removal. Censuses of population, and registers of births, deaths, and marriages, have withdrawn from the region of uncertainty, and transferred to the category of ascertained truths, large masses of facts no longer tools of the ignorant or designing.

This may be said to be the work of the science we cultivate, and those great central facts, cheap at the highest price we can pay for them, are sure harbingers of a continuous growth of the *knowledge* which is but another word for *power*.

The half century that has witnessed the successful labours of our Society will doubtless be followed by fifty years of still greater achievements. Surely this is no unreasonable expectation when we reflect that the world we live in, as it grows richer and more populous, by natural processes of development which war itself hardly disturbs, will supply an ever increasing number of workers, each new truth discovered releasing the intellect to deal with others yet undreamt of, while the world at this moment plagued with so many forms of hysteric excitement, may calm down under the cool influence of increasing knowledge and firmer exercise of will to that happier condition in which if neither pestilence, nor famines, nor wars shall cease, the nations, instructed by our figures, shall be more and more disposed to substitute the grand methods of prevention for the ever-recurring, ever-failing remedy of palliation, our means of prevention increasing as our knowledge of nature grows, and becomes more exact; while that application of principles which constitutes our science will not impair that skill in the manipulation of figures which is the essence of our art.

APPENDIX.

Quetelet, I have said, was much disquieted by discovering, as he thought, that the physical world and the social system obeyed like rules of causation, as measured by the figures of their respective periodical returns; and Buckle took the lead among those who made use of these figures of Quetelet to drag down the doctrine of Free Will to the level of Necessity. Buckle took Quetelet's figures as he found them. He did not take the precaution, nor did Quetelet himself, to rectify the figures which had so much moved him by others of a like order.

Here are two groups of figures which appear at first sight to justify Quetelet's views.

Murders in France for the five years 1826 to 1830 inclusive:—

241, 234, 227, 231, 205,

or an extreme difference of 36, and a mean fluctuation of $\frac{36}{4} = 9$.

Murders in France by gun and pistol for the same years:—

56, 64, 60, 61, 57,

or an extreme difference of 8, and a mean of $\frac{8}{4} = 2$.

If we raise the second group of figures to about the level of the first, by multiplying them by 4, we find the average fluctuation to differ but slightly in the two cases.

Both groups of figures, presenting as they do a low rate of annual fluctuation, seem at first sight to justify Quetelet's despondency. But this feeling is not justified if we take a larger and more comprehensive view of the same order of facts. These for instance are the figures which record the executions for murder in England in the five successive years 1847-51, reduced to an equal ratio of 20 millions of inhabitants:—

5, 4, 13, 9, 14,

giving an extreme difference of 10, or in one year more than three times as many as in another; or, take the following returns for insane criminals in the 20 millions for the five years beginning with 1847:—

47, 30, 33, 43, 24,

giving an extreme difference of 23, or in one year no less than the double of another.

Quetelet's inference therefore from the figures he adduced is not borne out by other figures of the same order; and the question of free will and necessity as tested by Statistics, remains untouched.

But I am understating the case. The case of Free Will *versus* Necessity is actually strengthened by figures collected and compared according to Quetelet's method. I will give a few examples,

premising that when I speak of a figure of fluctuation I mean the average of the interval between the maximum and the minimum of a series of years divided by the number of intervals, and reduced to a uniform percentage of the average of the fluctuations; low figures indicating steadiness, high figures the reverse. I subjoin the conclusions at which I arrived in a paper read to the Statistical Society in 1869 on "Insanity and Crime." I will state these results, appending to each one or more illustrations in figures:—

1. That in each considerable class of facts, in all the divisions and sub-divisions of statistics, or social science, there occur many degrees of fluctuation; events the most diverse exhibiting equal fluctuations by equal figures, and events the most nearly allied unequal fluctuations by dissimilar figures.

e.g., deaths by apoplexy, summary convictions, medical students entering King's College, London, 7.
Births, annual temperature, imports of tobacco, registrations at the College of Surgeons, 2.
Deaths, commitments for trial, 5.
Births 2, deaths 10.
Temperature 2, movement of air 14, rainfall 28.

2. That as a general rule, subject to many exceptions on both sides, events brought about by physical causes are subject to greater fluctuations and wider separation between extreme figures than events in the production of which the will bears a part.

e.g., *zymotic maladies.*—Small pox (L) 70, measles (E) 20, zymotic class, 70 to 18, average 26; weather diseases, 22 to 11 (bronchitis), 22.

3. That also as a rule the will, wherever it is brought into play, is an element of steadiness.

e.g., births and deaths 2 and 10, marriages 4, suicides (women) 9, lives offered for insurance in Eagle Office, 9.

4. That this steadying action of the will is most clearly seen when it is, so to speak, stereotyped, as in *habit*—a second nature—and in fraudulent offences; less clearly when it is in abeyance, as in accidents, or distorted by passion, as in crimes of violence:—

e.g., *habit.*—Imports of sugar, tea, wine, tobacco, 6, 4, 3, 2. Investments in consols, 3.
Crime.—Passion 22 to 10, mixed 5, fraud 3.
Criminals committed to the same prison once, summary convictions, 8 and 7. Committed twice, thrice, and four times, 5, 3, and 4.

Other acts of deliberation, 11 to 5. Investment of money in consols, bank, and India stock, 6 to 3. Writing and posting of letters, 5.

5. That this steadying action of the will is especially strongly marked in all acts that imply deliberation, and in cases in which one act of deliberation follows upon, or is added to, another:—

e.g., *first act of deliberation.*—Proposals for insurance in the Eagle Office, 9. Second act, cases accepted, 6. First act of deliberation, summary convictions, 7; second act, offenders sent for trial, 5, 4, and 3.

From the series of figures thus submitted to the reader, it will be inferred that Quetelet misapprehended the true facts of the case when he assumed, on the one hand, the stability of the physical world, and, making that his standard of comparison, saw in the leading facts from social life an analogy which had no real existence. For, if we take as the type of the physical world such measurable elements of the weather as rainfall, temperature, and movement of the air, we find that the rainfall is subject to the widest periodical fluctuations, and that the diseases known as zymotic, which are most affected by the weather, are, beyond comparison, the most fluctuating of all the social phenomena with which we have to do. The figures which the reader has before him constitute a simple reversal of the assumptions of Quetelet, for they show that the periodical fluctuations of our social phenomena, so far from being characterised by unsteadiness, form a series marked in different degrees by the narrow limits within which the fluctuations are restricted, that the physical world is subject to the greatest fluctuations, and that the periodical returns which the human will has contributed most largely to influence are remarkable for the very steadiness which Quetelet wrongly attributed to the physical world.

To those who honestly believe that anything may be proved by figures, I commend these misapprehensions of one of the greatest men who has devoted himself to the culture of Statistics, as an illustration of the operations of the scientific element in building up what may be fitly called a science of Statistics, when the first narrow view of the subject in hand has been expanded to larger dimensions.

It is hardly too much to affirm that the true doctrine of periodical fluctuations is to Statistics as a science, what the circulation of the blood and the true theory of the nervous system is to the science of physiology.

La Statistique *et ses* Ennemis.

Par A. de Foville, *Vice-Président de la Société de Statistique de Paris, Delégué du Ministère des Finances.*

La Statistique a pour elle aujourd'hui presque tous les hommes sincèrement dévoués au culte de la vérité scientifique; mais elle a encore contre elle un certain nombre d'esprits plus ou moins sérieux. Les uns lui déclarent franchement la guerre, et ne lui font pas grand mal. D'autres, avec des apparences pacifiques, quelquefois même avec des intentions amicales, sont, en fait, beaucoup plus dangereux.

Il m'a paru, Messieurs, que, dans cette réunion où la Statistique compte tant de personnifications éminentes, ce serait faire doublement œuvre de statisticien que de tenter le recensement ou, tout au moins, la classification de ceux qui se proclament eux-mêmes ou que je me permets d'appeler les ennemis de la Statistique.

Beaucoup de ces ennemis sont heureusement de ceux à qui l'on peut tendre la main. On dit en France—et c'est peut-être vrai à Londres comme à Paris—qu'il y a trois espèces d'amis: ceux qu'on aime, ceux qu'on n'aime pas, et ceux qu'on déteste. Par contre, on peut avoir des ennemis sympathiques, et ceux par lesquels je vais commencer ma revue appartiennent certainement à cette catégorie-là.

C'est le gai bataillon des moqueurs. En France comme en Angleterre, plus qu'en Angleterre peut-être, l'épigramme est un besoin pour les natures joviales, et un besoin facile à satisfaire, car il y a des plaisanteries qui ne s'usent jamais: plus elles ont servi, plus les amateurs les goûtent. Quand ce n'est pas tel ou tel individu qui en fait les frais, c'est tel ou tel groupe social, telle ou telle corporation. Il y a trois ou quatre villes en France—et des moins méprisables—qu'une tradition séculaire a ridiculisées. Il y a, de même, des professions aux dépens desquelles le théâtre et le roman aiment particulièrement à s'égayer. Du temps de Molière, c'étaient les poètes et les médecins. De nos jours, quand ce ne sont pas les concierges, les épiciers ou les notaires, ce sont les archéologues ou les statisticiens. Dès qu'un statisticien entre en scène, chacun s'apprête à rire; et il faut bien reconnaître que la littérature contemporaine a produit en ce genre des types fort amusants.

Pour ne parler que des nôtres, en voici quelques uns que le merveilleux auteur de "Hard Times" n'eût pas désavoués.

Dans un spirituel vaudeville de Labiche, *les Vivacités du Capitaine Tic*, le jeune premier qui, naturellement, porte l'épaulette, a pour rival maître Célestin Magis, secrétaire de la Société de statistique de Vierzon, lequel se vante d'avoir, entre autres prouesses, déterminé le nombre exact des veuves qui ont passé le Pont-neuf en 1860 : 13,498 . . . et une douteuse.

Dans *le Panache*, de Gondinet, nous trouvons aussi un confrère, l'illustre Ponthérisson, qui a voulu savoir quel est dans son département la proportion des gens mariés par kilomètre carré : 16 hommes et demi et 17 femmes trois quarts, voilà ce qu'il trouve, et il en conclut hardiment que, "pour équilibrer," il lui faudra marier, toujours par kilomètre, "un homme et demi avec trois "femmes moins un quart."

Rappelons encore, dans le *Jérôme Paturot* de Louis Reybaud, le statisticien, membre de l'Institut, qui, entre la poire et le fromage, daigne révéler à Jérôme les grandes jouissances et les petits secrets du métier : "Il ne se remue pas en France un petit "doigt que nous n'en soyons informés. Nous savons le nombre "d'œufs frais qui se dévorent chaque matin. Nous avons même pu "calculer approximativement le nombre des oiseaux qui peuplent "l'air, des poissons qui habitent la mer ; rien, dans la création, ne se "dérobe à notre puissance !" Et, comme l'ex-bonnetier qu'il veut convertir s'effraye et se déclare incapable d'un tel effort : "Bagatelle, mon collègue," répond le docteur ; "vous vous y ferez. Il n'y "faut qu'un peu d'assurance. Par exemple, vous dites : 'Il se "'récolte en Espagne 3,500,300,000 gerbes *et demie* de blé. . .' "Notez cette *demie :* elle est essentielle ; c'est la pierre de touche "d'un calcul méticuleux. Cette *demie* s'empare sur le champ du "public. 'Voyez, dit-on, quelle exactitude ! Ces gens là comptent "jusqu'aux fractions !' Et votre chiffre est désormais parole "d'évangile. Avec votre moitié de gerbe, vous avez conquis plus "de convictions qu'avec les trois milliards."

C'est peut-être après avoir lu cette fine page de son ami Reybaud que M. Thiers disait à un statisticien qu'il voulait taquiner : "La Statistique est l'art de préciser ce qu'on ignore !"

Je suis bien sûr, Messieurs, que ces légers coups d'épingle n'ont jamais attristé personne et ne sauraient décourager aucune vocation. Loin d'en garder rancune, je remercierais plutôt ceux qui exercent ainsi aux dépens de notre confrérie leur verve satirique. Au lieu de se reconnaître soi-même dans leurs caricatures, chacun de nous a toujours la ressource d'y voir le portrait de son voisin, et comment alors ne pas rire plus fort que les autres ? J'ajoute qu'il peut même y avoir d'utiles leçons à tirer de ces railleries. N'est-ce pas une faiblesse assez ordinaire aux statisticiens les plus officiels que de chiffrer en francs et centimes, ou en *pounds, shillings*, et

pence, des évaluations pour lesquelles le million serait encore une unité trop faible : Jérôme Paturot les aidera à se corriger de ce travers. L'exemple de Ponthérisson inquiétera les démographes qui abusent du droit de couper les hommes en deux et les femmes en quatre. Et le souvenir de Célestin Magis arrêtera quelquefois à temps ces enragés calculateurs dont la spécialité est de consacrer leurs veilles à des problèmes qui ne peuvent intéresser qui que ce soit au monde, pas même eux.

L'indulgence dont je ne puis me défendre à l'égard des joyeux compères qui se moquent de nous me paraît également due aux gens qui, de bonne foi, jugent tous nos labeurs absolument inutiles. Je ne parle point ici de la foule des ignorants, pour lesquels toute science constitue le moins nécessaire des superflus. Je parle des hommes dont l'indifférence est voulue, réfléchie, presque raisonnée ; je parle des hommes dont l'opinion très-arrêtée est que nos poursuites sont vaines, et que nous perdons tous notre temps, sans avoir même l'avantage de le perdre agréablement. Lorsqu'ils nous voient aux prises avec nos tableaux, nos courbes ou nos cartes, chacun suivant sa piste et s'absorbant dans ses investigations solitaires, ils ne nous rient pas au nez comme les autres ; mais ls haussent doucement les épaules, et, convaincus que l'aridité de nos études en implique la stérilité, ils disent tout bas : "A quoi bon ?"

Oh ! n'essayez pas de les convertir ; la plus persuasive éloquence n'y réussirait pas. Vainement leur recommanderiez-vous la lecture des livres de nos maîtres. Vainement leur rappelleriez-vous le goût persistant de Napoléon I pour ce qu'il appelait "le budget "des choses." Vainement leur montreriez vous un penseur comme Charles de Rémusat proclamant l'incomparable fécondité de la science que nous cultivons. Il y aura toujours des incrédules qui persévéreront dans leur impénitence, et dont nous ne saurions espérer la conquête, si enviable qu'elle puisse parfois paraître. J'ai vu la Statistique systématiquement dédaignée par de sagaces géomètres, par de charmants poètes, par des artistes hors ligne. Le géomètre, habitué à vivre dans les désertes profondeurs de l'espace et de l'absolu, ne daigne pas abaisser ses compas au niveau des choses humaines. Quant à l'artiste et au poète, le culte du vrai n'a guère de sens pour eux quand il ne se confond pas avec le culte du beau, et notre muse austère parle une langue que les leurs ne comprennent pas. Laissons les à leurs rêves et jouissons de leurs œuvres sans leur demander de s'occuper des nôtres.

D'autres seigneurs auxquels il ne faut pas réclamer non plus "cette honneste curiosité de s'enquérir de toute chose" que notre vieux Montaigne prêchait à ses contemporains, ce sont les Orientaux. Leur fatalisme contemplatif croirait manquer de respect

au Souverain Moteur de l'univers en en interrogeant de trop près e mécanisme. "*Allah aalam*, Dieu sait mieux que nous ce qui en est," disent-ils, et cela les encourage à ne rien analyser. M. Ernest Renan nous a raconté la curieuse expérience que fit autrefois de cette religieuse discrétion du musulman votre éminent compatriote Sir Henry Layard. Dans les premiers temps de son séjour à Mossoul, il avait demandé au Cadi quelques données précises sur la population de la ville, sur son commerce, sur sa richesse, sur son histoire. La réponse du Cadi est un vrai bijou :

" O mon illustre ami, ô joie des vivants !

" Ce que tu me demandes est à la fois inutile et nuisible. Bien " que tous mes jours se soient écoulés dans ce pays, je n'ai jamais " songé à en compter les maisons, ni à m'informer du nombre de " leurs habitants. Ce que celui-ci met de marchandises sur ses " mulets, celui-là au fond de sa barque, c'est une chose qui ne me " regarde nullement. . . .

" O mon ami, ô ma brebis, ne cherche pas à connaître ce qui " ne te concerne pas. . . . Il n'y a point de sagesse égale à celle " de croire en Dieu. Il a créé le monde : devons-nous tenter de " l'égaler en cherchant à pénétrer les mystères de sa création ? " . . . Moi, je bénis Dieu de ne pas chercher ce dont je n'ai " pas besoin. Tu es instruit dans des choses qui ne m'intéressent " pas, et ce que tu as vu je le dédaigne. . . .

" O mon ami, si tu veux être heureux, écrie-toi : ' Dieu seul " ' est Dieu ! ' Ne fais point le mal, et alors tu ne craindras ni les hommes, ni la mort. . . .

" Car ton heure viendra."

Le plus féroce statisticien ne se laisserait-il pas désarmer par une si sereine philosophie ? Pour ma part, j'en suis très touché. L'honnête Cadi qui professait cette pieuse insouciance n'a pas dû mourir jeune : si je pouvais espérer qu'il est encore de ce monde, je me risquerais à demander pour lui à l'illustre Société qui nous fait ici un si gracieux accueil le titre de membre correspondant.

L'indifférence en matière de statistique, excusable chez ceux qui n'en font pas, devient plus repréhensible chez ceux qui, sans être du métier, travaillent pour nous. La plupart de nos enquêtes exigent de nombreuses collaborations et les personnes qui y mettent la main n'ont pas toujours pour l'œuvre commune la sollicitude et le respect qui seraient nécessaires. L'erreur peut ainsi se glisser partout. Un de nos présidents les plus regrettés, M. Léonce de Lavergne, avait un jour cherché et trouvé une explication à la décroissance du nombre des cotes foncières dans le département de Seine-et-Marne. Quelque temps après, notre excellent collègue M. Gimel lui montrait qu'en fait le nombre des cotes n'avait cessé de croître dans cette partie de la France comme dans les autres.

La diminution annoncée résultait uniquement des fautes de calcul d'un expéditionnaire distrait. Les accidents de ce genre sont toujours à redouter. A coup sûr, on nous attribue plus de mésaventures que nous n'en subissons; mais les histoires qu'on raconte ne sont pas toutes inventées; veut-on me permettre d'en citer ici une que je crois inédite et que je sais authentique?

J'ai connu un digne vieillard qui, dans une petite ville des Ardennes, représentait la Société météorologique d'une ville beaucoup plus importante. Sa mission consistait principalement à enregistrer, pour les transmettre à qui de droit, les variations barométriques, et il s'en acquittait avec une extrême ponctualité. Personne chez lui n'avait la permission de toucher à son baromètre. Un matin, cependant, une servante flamande, qui s'indignait de voir le précieux instrument couvert de poussière, l'avait décroché pour l'épousseter. Par précaution, elle l'avait couché sur ses genoux, et deux bulles d'air avaient déjà pénétré dans le tube quand le maître rentra. Jugez de sa consternation. Son premier mouvement eût été de chasser celle qu'il venait de surprendre en flagrant délit. Mais le bonhomme, au fond, était philosophe, et la servante avait de grandes qualités. Le jugement fut remis à huitaine d'abord, puis à quinzaine. . . . En attendant, le vieillard avait repris, comme si de rien n'était, le cours de ses observations et de ses communications périodiques. Peu à peu, l'âge aidant, il ne se souvint même plus qu'il lui manquait toujours un ou deux centimètres de mercure, et, quand son heure fut venue, il s'éteignit doucement, juste à temps pour ne pas voir paraître dans l'annuaire de sa Société un docte mémoire, signé d'un nom connu, intitulé: "*De la persistance des dépressions barométriques dans la région des* "*Ardennes.*"

Contre ces infidélités, inconscientes ou non, des agents qui lui fournissent la matière première de ses travaux, la Statistique est souvent désarmée: elle ne l'est pas toujours cependant, et les délinquants se trompent quelquefois en se promettant l'impunité. Voici un exemple entre cent des désobligeantes surprises auxquelles ils peuvent s'exposer.

Le Gouvernement français a fait en 1878 et vient de refaire, il y a quelques semaines, un classement, par nationalités et par âges, de toutes les pièces de 20, 10 et 5 francs existant, à un moment donné, dans nos 20,000 caisses publiques. Pour chaque caisse en particulier, le travail prescrit par le Ministre des finances était peu de chose, et l'immense majorité des comptables s'en sont acquittés d'une manière très consciencieuse. Mais quelques uns s'étaient fait une fête de remplir au hasard de la plume les cadres imprimés qu'on leur avait remis: l'administration allait être bien dupe et, d'avance, entre amis, on en riait de bon cœur. Malheureusement

les inventeurs de cette agréable mystification ne savaient pas que la frappe des monnaies d'or ou d'argent a quelquefois été suspendue en France pendant des années entières. Il n'existe ni pièces de 20 francs de 1872, ni pièces de 10 francs de 1853, ni écus de 5 francs de 1861. Or nos malins avaient mis de tout cela sur leurs tableaux. Il était impossible de mieux trahir sa faute, et les coupables, pris au piége, riaient moins le lendemain que la veille.

> " Tel, comme dit Merlin, cuide engeigner autrui
> Qui souvent s'engeigne soi-même."

La Statistique est malheureusement exposée à de plus graves attentats que ceux dont je viens de parler. D'un instrument de vérité, l'ignorance, l'intérêt ou la mauvaise foi font trop souvent le véhicule de l'erreur. Pour donner aux affirmations les plus téméraires l'apparence de la certitude, on jette tous les jours de faux chiffres à la tête des badauds, comme Sganarelle, dans le *Médecin malgré lui* de Molière, y jette son faux latin, et ce facile charlatanisme manque rarement son effet. La foule commence toujours par admirer ce qu'elle ne comprend pas. Seulement, quand elle a vu le *pour* et le *contre* revêtir ainsi le même costume, elle finit par se douter qu'on la trompe, et, passant de l'extrême crédulité à l'extrême défiance, elle en arrive à se croire aussi bien jouée par ceux qui lui disent : " Deux et deux font quatre," que par ceux qui lui disent : " Deux et deux font cinq ! "

Ah ! Messieurs ; les faux statisticiens, voilà nos vrais ennemis ! Je pourrais presque dire : Voilà nos seuls ennemis.

Et nous avons guère de recours contre eux. Que dire, que faire à ces amateurs trop novices ou à ces jongleurs trop subtils qui font peser sur la Statistique la lourde responsabilité de leurs élucubrations saugrenues ou de leurs perfides argumentations ? Notre Code punit l'exercice illégal de la médecine ; il ne punit pas l'exercice irrégulier de la Statistique, et c'est ainsi que notre pavillon se trouve réduit à couvrir malgré lui de si étranges marchandises.

J'avais un jour, Messieurs, conçu une entreprise pour laquelle je n'ai pas tardé à me reconnaître tout-à-fait insuffisant, mais qui mériterait, ce me semble, de trouver place dans le programme de toutes les savantes sociétés qui sont ici représentées. Je m'étais donné la mission de saisir au passage et de dénoncer une à une, partout où je les rencontrerais, dans les livres, dans les journaux, dans les discours politiques ou autres, toutes les applications visiblement abusives de la Statistique. Cette sorte de police scientifique, si elle pouvait être solidement organisée, rendrait de grands services. Mais je me suis convaincu qu'il faudrait s'appeler légion pour y suffire. Les procès-verbaux se compteraient chaque

jour par douzaines. Et pourtant la nature des contraventions ne varie pas beaucoup. Deux fois sur trois, on se retrouve en face de l'éternel sophisme qui consiste à considérer la simple simultanéité de deux phénomènes quelconques comme impliquant nécessairement entre eux une corrélation plus ou moins étroite : *cum hoc, ergo propter hoc.* C'est vieux comme le monde, mais on s'y laisse toujours prendre.

Et voyez quel vaste champ la statistique ouvre à la culture de ce genre d'erreur ! Parmi les mille *variables* dont les mouvements successifs peuvent intéresser le philosophe, le moraliste, l'économiste, le financier, l'homme d'État, il en est un certain nombre dont les fluctuations sont très capricieuses ; mais, abstraction faite de celles-là, il en reste beaucoup dont la *courbe* va presque toujours en montant et d'autres dont la *courbe* descend de plus en plus. Cela étant, prenez les yeux fermés deux de ces courbes, n'importe lesquelles, et vous allez pouvoir, en les présentant seules à un public suffisamment inexpérimenté, conclure de leur parallélisme ou même de leur divergence à une filiation qui, bien souvent, sera purement imaginaire.

C'est ainsi que certains hommes qui ont voué au tabac une haine un peu aveugle lui imputent en bloc, sans distinction, tous les fléaux que notre siècle a vu naître ou grandir : *cum hoc, ergo propter hoc.*

Et j'ai rencontré—venant, il est vrai, des environs de Charenton—un spécimen encore plus hardi de ce mode de démonstration. Le génie méconnu auquel je fais allusion avait toujours détesté les pommes de terre, ce qui est déjà une aberration ; il détestait aussi les révolutions, ce qui était plus sage ; et, dans un long mémoire, il établissait "l'influence de la pomme de " terre sur les révolutions." Il ne remontait pas jusqu'au déluge, et pour cause ; mais il savait qu'en Angleterre l'introduction des *potatoes* a précédé Cromwell : la preuve s'en trouve dans Shakespeare. Actuellement c'est surtout l'Irlande, dans le Royaume-Uni, qui s'adonne aux tubercules, et n'est ce pas là aussi que le ciel politique a le plus d'orages ? En France, on sait que l'imprudent Louis XVI aida Parmentier à réhabiliter un légume longtemps dédaigné, et Louis XVI, comme Charles I, a fini par la prison et l'échafaud. Toute l'Europe, d'ailleurs, fournissait à mon auteur de nombreux arguments, car la consommation des pommes de terre et la propagation des idées subversives marche de bien des côtés d'un pas également rapide. Vraiment, la thèse était spécieusement développée, et on l'eût facilement déclarée concluante, si la conclusion même en eût été moins folle.

La pomme de terre exercerait-elle aussi une action perturbatrice sur l'esprit des calculateurs ? On serait tenté de le croire, car

Moreau de Jonnès raconte que, dans la première moitié de ce siècle, un agronome français avait cru pouvoir chiffrer à 222 millions d'hectolitres la production totale de la France en pommes de terre. "On s'efforça inutilement de savoir comment il s'était procuré ce "nombre. Mais lors de l'enquête générale dont la statistique "agricole fut l'occasion, on trouva que la commune de ce savant "rapportait précisément 6,000 hectolitres, qui, multipliés par le "nombre des communes du royaume (37,000) donnaient pour "total les 222 millions qu'il avait assignés à la production de "la France entière. Ce résultat, ajoute Moreau de Jonnès, était "de cent pour cent au delà de la vérité." Il est clair qu'il aurait pu s'en écarter bien davantage.

C'est vraiment chose extraordinaire de voir avec quelle facilité des esprits qui ne sont pas toujours les premiers venus se payent de mots ou de chiffres, sans même y être sollicités par un intérêt personnel. Savez-vous ce que c'est que la météopsychologie? Le capitaine Delauney nous le dit. Les ingénieux inventeurs de cette science nouvelle expliquent l'histoire des peuples, l'un par tremblements de terre, toujours accompagnés de graves évènements politiques; l'autre par les oscillations du magnétisme terrestre, dont la lente périodicité (516 ans) serait forcément celle des grandes évolutions de l'humanité; un troisième fixe, sans dire pourquoi, à 165 ans *environ* l'intervalle régulier des calamités exceptionnelles, au nombre desquelles il inscrit d'abord la mort d'Alexandre et celle de Judas Maccabée. A ce compte, tout nombre serait bon pour organiser cette espèce de *Jeu de l'oie* historique, car où sont, hélas! dans le passé les dates qui n'ont eu ni deuils retentissants, ni violences criminelles? Mais l'homme épris d'une théorie suspecte trouve toujours moyen de lui donner raison, quelle que puisse être la résistance des faits. Lorsqu' après la mort de Napoléon I, son crâne eût été moulé dans le plâtre, les phrénologues de Paris eurent le désagrément qu'on n'y put découvrir aucune des bosses voulues, pas même celle de l'art militaire. Il y eut alors dans le cénacle un moment d'agitation; mais le Président sauva la situation en déclarant que, tout considéré, les talents de l'Empereur avaient été très surfaits, et que ses victoires n'avaient peut-être été dues qu'au hasard.

Ceci tendrait à prouver, Messieurs, que la Statistique n'est pas la seule science que puissent discréditer les fantaisies des gens pour lesquels tous les raisonnements sont bons, surtout les mauvais. Mais la Statistique reste plus exposée que d'autres à cet inconvénient parce que tout le monde se croit capable d'en faire. De là cette multitude de faux statisticiens qui se gardent bien de venir frapper à votre porte, mais que le journal et la tribune se disputent quelquefois. Quand ils ont écrit ou parlé, on dit: "La Statistique

"prouve . . . La Statistique démontre . . ." Et nous endossons malgré nous la responsabilité de leurs billevesées.

Remarquez bien, Messieurs,—et c'est la dernière observation que je me permets de vous soumettre—remarquez bien qu'en insistant sur le préjudice causé aux vrais statisticiens par les erreurs des autres, je suis loin de réclamer pour qui que ce soit le brevet de l'infaillibilité. *Errare humanum est.* Les maîtres qui m'entourent seraient les premiers à protester si je voulais les mettre, à cet égard, en dehors de la loi commune. Sur les terrains mouvants où nous entraîne souvent la nature de problèmes que nous avons à résoudre, les faux pas ne sont que trop faciles.

Vous avez du moins sur les profanes cette supériorité que vous avez toujours honoré la science qu'ils compromettent et que vous vous laissez conduire docilement par elle dans la voie de la vérité, au lieu de l'entraîner de force dans des chemins de traverse où elle ne peut que s'égarer.

Vous vous rappelez comment Cicéron, dans un beau mouvement d'orgueil professionnel, définissait l'orateur: "L'orateur," disait-il, "c'est l'honnête homme qui sait parler."

Laissez moi dire, Messieurs, que le statisticien, le vrai statisticien, c'est l'homme sincère qui sait raisonner et compter.

The meeting adjourned at 5.40 p.m. until the following day at 11 a.m.

Tuesday, 23rd June. *Second Day.*

Theatre of the University of London, Burlington Gardens.

Sir Rawson W. Rawson, K.C.M.G., C.B., President, took the Chair at 11 a.m.

Some General Uses *of* Statistical Knowledge.

By R. Giffen, LL.D.

In my inaugural address as President of the Society in 1882, my topic was the influence of statistics on general political ideas and in providing problems for the deliberation of statesmen and politicians—in other words, the utility of the most common figures of statistics. In addition to all their other uses, and their use in detail in testing the effect of particular pieces of legislation or solving special problems as to the rate of mortality and the like, the most common figures of statistics, it was pointed out, had their uses in illustrating and clearing up familiar problems in politics, in making, as it were the very atmosphere of politics, from which nations could not escape, and which got about in general discussion and literature, although many politicians themselves might be ignorant of statistics and the right mode of handling them. My illustrations were also derived almost exclusively from population statistics. The vigorous growth of European and civilised races, giving them the command over the whole world in a way that no similar civilisation had before; the displacement of political power in Europe in the present century through the growth of Germany, Russia, and the United Kingdom, while France and Austria remained comparatively stationary; the enormous relative diminution of the hostile Irish element in the United Kingdom, mainly through the growth of population in Great Britain, and only partly through the diminution of population in Ireland; the economic problem raised in India by the rapid growth of population under the Roman peace we have established; and finally the rapid growth of population in America and English speaking colonies, coupled with the fact of the increased dependency of European nations upon foreign supplies of food, so that we are coming within measurable distance of the time when there will be no new lands wholly unoccupied over which European populations may spread,—were all referred to as making part of the political atmosphere of the time, as generating ideas which were thus derived from the most common figures of statistics, and which

could hardly have been formed without those continuous official records which the principal nations have now possessed for nearly a century. In the present paper I propose to illustrate farther the theme of the above address. The most common figures of statistics supply many more ideas to the political thought of the time, and in few ways, as I believe, are statistics more serviceable to society than in supplying such topics for discussion.

I propose on the present occasion to begin by referring at more length than I did in my former address to the remarkable growth of European populations in recent times, in both the respects dwelt on before, viz., the vigour of Western European civilisation implied in this growth, and the displacement of political power which has accompanied it.

For this purpose I propose to use as a starting point a table which I find in M. Moreau de Jonnes's "Elements de Statistique," giving the population of Europe, according to the most trustworthy authorities, just before the outbreak of the French Revolution—that is, about one hundred years ago. With this table I have compared the population of Europe as recorded at the last census of the different countries concerned, so that in fact we have a hundred years' progress in population before us. The table of M. Moreau de Jonnes is very carefully compiled, and although there were hardly such things as good censuses until the present century, the investigations which have since been made, and the scattered notices as to the population of principal countries in previous periods, all tend to show that, for the purposes of a comparison such as I now make, the table may be accepted. Even if it is a few millions out, that would hardly matter as regards a comparison extending over so long an interval. The result of this comparison is seen in detail in the accompanying table (p. 98). It has to be considered in reading it that changes have been made by the alteration of national boundaries and the like, but the broad results are not affected by such considerations.

Population of Europe in 1788 *and at the Present Time Compared.*

[*Note.*—The figures for 1788 are from M. Moreau de Jonnes' "Elements de Statistique," p. 429, *et seq.*]

[In thousands.]

1788.		Present Time.	
Sweden and Finland	2,560	Sweden	4,565
		Finland	2,060
Denmark and Norway	1,490	Denmark	1,969
		Norway	1,925
Russian Empire	24,000	Russian Empire and Poland, exclusive of Finland	96,300
Poland	2,800		
Great Britain and Ireland	12,000	Great Britain and Ireland	36,000
Holland	1,800	Holland	4,013
France	24,800	France	37,321
Germany	9,000	German Empire	45,234
Prussia	6,400		
Austria and Low Countries	19,611	Austria Hungary	37,806
		Belgium	5,520
Switzerland	1,800	Switzerland	2,846
Spain	10,500	Spain	16,634
Portugal	2,800	Portugal	4,160
Italy	16,000	Italy	28,459
Turkey and Greece	9,000	Greece	1,679
		Bulgaria	1,998
		Servia	1,500
		Roumania	5,500
		Turkey in Europe*	6,000
	144,561		341,489

The most general figures are very striking. The population of Europe at the present time comes out at 341,489,000; but allowing for the increase in Germany and other countries since the last census, not included in the table, and for the fact that a year or two has still to elapse before the interval of one hundred years is covered, we may put the population at the present time, for the purposes of comparison, at the round figure of 350 millions. The population in 1788 in like manner, which comes out at 144,561,000, may be spoken of roundly as 145,000,000. The increase has accordingly been as follows:—

	Millions.
European population at present time	350
" a hundred years ago	145
Increase	205

The population in other words has increased about one-and-a-half times, so that whatever Europe was a century ago in relation to countries like China and India, and the miscellaneous native

* Exclusive of Bulgaria and Bosnia.

populations of Africa and the American continent, then, unless these countries have changed in population in like manner, which there is no reason to believe, the preponderance of Europe in the world, if there was preponderance before, must have enormously increased. We may take it for granted, I think, that, except in India, no such increase has been possible. In China, Africa, and elsewhere, the condition of the native populations is even now such that numbers must increase but slowly; they are still in the condition from which the European races themselves emerged only at the beginning of last century, and from which perhaps they had not fully emerged until about a hundred years ago, when the accompanying table begins.

The comparison does not stop here. To the increase of the population in Europe we must add the increase of European populations outside Europe, which has been on an enormous scale in the last hundred years. The whole population of the United States, Canada, the Australian Colonies, the white population at the Cape, and part of the populations of Brazil and the South American Republics, fall to be included in this increase; and if we take the European population a hundred years ago at 150 millions, to allow for the numbers existing at that time in the United States and elsewhere, and then compare it with the present European population, both in and out of Europe, we shall probably have a comparison not far from the mark. These extra-European populations of European descent may be reckoned as follows at the present time:—

	Millions.
United States, deducting negro population*	55
Canada	4½
Australia	3
Cape of Good Hope	–½
South American Republics and Brazil, say	7
Total	70

And allowing for this extra-European population, we get the following comparison:—

	Millions.
European population in Europe at present time, as above	350
" out of Europe	70
Total	420
European population in and out of Europe in 1788	150
Increase	270

* This is allowing for a considerable increase since last census down to 1885.

The increase on this showing is much more than one and a half times; and is nearly as much, it will be observed, as the populations of either India and China, which are by far the most important in respect of numbers of the populations outside Europe. If we take European populations as one mass, then the present total of 400 millions and upwards most assuredly gives them the preponderant position in the world. Allowing for the present rate of growth, if it should only continue another century, these numbers, from being 400 millions, will grow to over 1,000 millions; so that the present numbers of India and China will be enormously exceeded. Allowing indeed for the special growth in the United States which will have a population of 800 millions in a century, if there is no change in the rate of growth, and for a similar growth in English speaking colonies, the number of 1,000 millions at the end of a century as the population in Europe or of European descent will be greatly exceeded. New events may bring about an enormously larger growth of non-European population, or the European rate of increase may itself fall off; but neither of these changes will occur without a revolution in what has become the existing order, of which an extraordinary and exceptional growth of the European races seems a part. The preponderance of European races is of course further assured by the sovereignty they have established in every part of the world over other races. But it may be questioned whether the preponderance would not have been better ensured by the absolute refusal of European races to undertake such sovereignty. It is European rule which makes possible in some parts of the world a growth of other races at a rate resembling that of European races themselves, and which in the end, as in India, may raise up very difficult problems for the ruling race.

Of course questions may also be raised as to the quality of the European increase itself. The European races, as we know, are not all of the same type. Among the peoples which have increased most we have English, German, Russian, and some of the southern nations. The preponderance of Europe in the world will depend very much on which race is preponderant, and the results in the future may be very different, according as the preponderance among the increasing race itself falls to the English and German, or to the Russian, portions of the race. In the latter case clearly the increase is that of a population which assimilates the non-European races more quickly than English or German, but which is at the same time less distinctly "civilised" in the sense we understand in Western Europe. The relative growth of these different peoples in the last hu dred years may be described as follows:—

Increase of English, German, Russian, and South European Peoples compared.

[In millions.]

	1788.	Present time.	Increase.
1. English, viz. :—Sweden; Denmark and Norway; Great Britain and Ireland; Holland; *in Europe*	17½	50½	
Ditto, out of Europe	4½	62½	
Total	22	113	91
2. German, viz. :—Germany and Austria, deducting Belgium and including Austria-Hungary at present time	35	83	48
3. Russian, *including Finland*	27½	98½	71
4. Races of South European Countries, including France, Belgium, and Switzerland, *in and out of Europe*	65½	125½	60
Grand total	150	420	270

According to this table the increase of the English people, while the greatest in amount, is the most remarkable in every way, the numbers being now fivefold what they were a century ago, while the Russian numbers which come next are less than four times what they were, the German are only two-and-a-half times what they were, and the other races of Europe are only twice what they were. It has to be considered, however, that part of the so-called English increase is really in point of blood, a German increase; the German increase beyond the seas being credited to the English race, because the two races are blended and the latter is predominant in the blend. A certain part of the Russian increase is also due to the conquest of non-European races, though not so much as is sometimes supposed; the main increase of Russian population in the last hundred years having undoubtedly been an increase of pure Russian breed, which has found room to grow by a process of internal emigration and colonisation. It remains to be seen what the relative progress will be in future. The probabilities would seem to be that as the increase of the English race with the German blend has, apart from conquest, been so exceptionally rapid, and as the circumstance of its owning a vast unoccupied area exceptionally favours the growth of that race, which is exceptionally favoured, moreover, by the possession of vast capital and enterprise permitting a special increase of non-agricultural population, then the English race in and out of Europe in another hundred years will increase more rapidly than any other parts of the European race. In another century, at the past rate of progress, looking at that progress in detail as above explained, there will be nearly 1,000 millions of this race alone in the world; while the

Russian race, apart from conquest, will not exceed 300 millions, and the others increasing more slowly still will lag far behind. Here again the conditions may be altered. Germany, for instance, by acquiring a territory of its own suitable for colonisation, may increase at a greater rate than in the past, while the diversion of German emigration from English colonies and the United States may diminish the rate of increase of those regions. But there is hardly time now for such a diversion to make a great difference in the eventual result. A material diversion of German emigration is hardly possible very soon, on account of the greater attractiveness of existing settlements as compared with settlements that are wholly new, as we see with regard to the United States, which continues to be the main field for emigration, just because there is more partly settled country there than in any other quarter.

I shall have additional remarks to make on the relative progress of the different sections of the European race in connection with the question as to whether or not there has been an average increase of wealth per head among those populations that have increased so rapidly, which I propose afterwards to discuss. Meanwhile I pass on to notice one or two obvious facts as to the displacement of political power implied by the figures. The prominent facts clearly are that of the great European powers, England, Germany, and Russia have grown enormously, changing with reference to each other and with reference to the rest of Europe, while the Austrian Empire and France have grown but little in comparison. The facts on this head are :—

Comparative Growth in Population of the Five Great European Powers, and of the rest of Europe, in a Hundred Years—1788-1885.

[The figures in the amount columns are stated in millions.]

	Population, 1788.		Population, 1885.		Increase.	
	Amount.	Per Cent. of Total.	Amount.	Per Cent. of Total.	Amount.	Per Cent.
England (the United Kingdom)	12	8·2	36	10·4	24	200
Russia, with Poland	27	18·5	98	28·6	71	260
Germany	15	10·2	45	13·4	30	200
France	25	17·1	37	10·8	12	50
Austria	20	14·4	38	11·1	18	90
Rest of Europe	46	31·6	88	25·7	42	110
Total	145*	—	342*	—	197	136

* In this table, as it is necessary to make comparisons in detail, the totals are given as in the table on p. 98, and not the round figures of 350 millions as the total population of Europe at the present time and 150 millions as the population a hundred years ago which are elsewhere used.

Thus England, Russia, and Germany have all gained relatively in numbers, while the proportions of France and Austria and of the rest of Europe to the total have declined. This is not the place, nor would this be the occasion, to discuss a purely political question. It is obvious also that the question of relative power is not determined exclusively by numbers. All that need be said here is that so far as numbers are an element in such questions, the changes in Europe in the last hundred years have been immense. How far the effect of changes in numbers is modified by other causes is clearly a question which it would be important for the politicians of all countries to take note of.

The most serious qualification to be made in the table relates perhaps to Russia. The population of 98 millions includes 14 millions of people in Asia. By parity of treatment, the non-European population of the British Empire ought, it would seem, to be included. Even if this 14 millions were deducted, however, the increase of population in European Russia would still be from about 27 to 84 millions, or more than 200 per cent., a percentage increase equal to that of England or Germany, while the amount would still be larger than in either of the two other cases.

In connection with this increase of population, I have to notice again, as I noticed before, that the progress of Italy is very marked. With a population of 28 millions and upwards, Italy is coming very nearly into the rank of the great powers, as far as numbers are concerned, and at the present rate of growth must soon approach very closely the numbers of France and Austria.

Another aspect of this change of numbers has to be noted. Two at least of the great powers—Russia and England—have more contact of a political kind with each other outside Europe than they have in Europe. It is as Asiatic powers they are related most closely in the rivalry for empire. England, generally, and to some extent Russia, have also very close relations of neighbourhood to other non-European powers. The English empire altogether, as Mr. Gladstone long ago pointed out, is not so much a European as an inter-continental power, whose general relations throughout the world have to be studied by those concerned, and not merely its special European relations. France is another of the great powers which has also such European relations, though these are not so great relatively to French interests as those of either Russia or England. Lately, too, Germany and Italy have shown a disposition to change from specially European into inter-continental powers. It is obvions then that international politics have become a very different thing from what they were a century or two ago. From being questions between powers in western

Europe—a small corner of the world,—and affecting an aggregate population no larger than that of one of the great powers of Europe at the present time, they have become questions of world-wide range, affecting hundreds of millions. The people of Europe have outgrown their narrow limits, and are become the peoples and powers of the world. Last century, just before the French Revolution, the rivalry between France and England in America and the East anticipated to some extent what has become the normal characteristic of the new era. All the nations of Europe are bigger, and the overflow brings them into contact outside Europe itself. It would be out of place here to discuss all the consequences of these widely extended imperial relations. They are, however, most directly connected with the predominance of the European races in the world, which has developed so greatly during the last hundred years, and which is still developing so fast. Meanwhile, as I remarked in my former paper, especially with reference to the growth of the United States, the purely European politics are dwarfed.

Before passing from this question of the displacement of political power due to changes in population, I may perhaps be allowed to note that as yet politicians on some of these questions hardly relish statistics, and are disposed to ignore them altogether. One of those I referred to in my former paper, viz., the diminution of the danger of disloyalty in Ireland by reason of the changes in the proportion of the Irish population to that of the United Kingdom, has incidentally come up for consideration in connection with the Redistribution of Seats Bill, which is still pending; but politicians as yet have refused to recognize the anomaly of the Irish representation which creates so much of the political difficulty. Ireland being at the present time entitled by population to rather less than a seventh of the representation of the United Kingdom, politicians confirm it in the possession of nearly a sixth of that representation, giving it over 100 members instead of about 90 only, and instead of the 30 to which it would be entitled if it were represented in proportion to its numbers in the same way as it was represented at the time of the Union and long after. It is safe to predict that before long these and other anomalies in representation will be corrected. The figures in such matters represent facts, and it is impossible to suppose that, however unwilling politicians may be to touch problems of this sort, the fact of an artificially large representation in the Imperial Parliament being given to a portion of the United Kingdom which happens to be hostile to the rest will long be tolerated. What politicians seem to forget is that the anomaly becomes more

flagrant every year by the force of the growth of population. At the census of 1871 Ireland was just about entitled to the representation it then had, on the basis of mere numbers, perhaps to rather more. At the census of 1881 it was entitled to 96 members only against the former 105. In 1884 the proper proportion was about 92 members; in the current year it is about 90 only; by the next census it can hardly exceed 80; and by the census of 1901 the proportion will be about 71. It is sometimes urged that there is no knowing beforehand how population will change. Population, it is said, may flow back to Ireland, and the growth in the United Kingdom may be arrested. It is tolerably certain, however, to any one who cares to follow the movements of population, that such changes in the dynamics of the matter as would be implied by any sensible reflux to Ireland or arrest of the growth in the United Kingdom are most improbable, in fact, so very improbable that action ought to be based on the assumption that they will not occur. They would imply a very sweeping economic and social revolution indeed. It would be quite safe, therefore, for Parliament to anticipate changes in population a few years ahead, and so give rather more in proportion to districts where the growth is fastest.

In any case disaffection in Ireland being only the disaffection of a palpable fraction of the whole United Kingdom, can never be the same influence that it was when Ireland contained half the population of Great Britain. It is now an easier problem in every way to deal with. There is no force in Ireland to demand separation capable of measuring itself, even by the happiest fortune, with that of the United Kingdom; and the separation of the disaffected part of Ireland, if it could be brought about, might become tolerable, like the separation of the Isle of Man and the Channel Islands, just because that disaffected part is relatively so small. These hard facts must govern the situation in whatever way politicians, for purposes of their own, or for any or no reason, adjust the representation. Still it is extremely interesting to note how shy in this instance politicians have been of statistics, though they quote statistics often enough. The want of respect for facts must be held to prove how much political education is in arrear.*

The next broad conclusion from the most common statistics which affects the ideas of the time is the enormous multiplication of resources in the communities in question. These communities, which have been increasing so enormously in population, have

* The following short table shows what the proportionate representation of Ireland would be according to the numbers of the census of 1871 and 1881, and

been increasing more remarkably in wealth. It would be impossible for me to state figures on this head for the whole of Europe, but the immensity of the change can be shown by a reference to one or two figures only. Thus, for the United Kingdom the average capital per head a century ago could hardly be put at more than 100*l.*, if so much. In 1815 the wealth of Great Britain per head was reckoned at 170*l.* only, although great progress had been made in the interval from 1788, so that, allowing for such an increase, and for the comparative poverty of Ireland, 100*l.* per head a century ago for the whole of the United Kingdom seems ample. This would make English capital then about 1,200 million pounds only; whereas, according to my own calculation on the basis of the income tax figures of 1875, the capital then was 250*l.* per head or 8,500,000,000*l.* altogether, an increase of seven times in less than a century. In France there has equally been a vast increase, the present capital being estimated at not far short of that of England, while a century ago it would hardly exceed 2,000 millions. In the United States comparisons are thrown out by a change in the basis of the figures of the last census, but there has certainly been an immense increase—from about 40*l.* per head a century ago to at least 150*l.* The capital of these three nations alone may figure out as something like 24,000 million pounds sterling. There may have been no such increase in other countries, though the increase in Germany at least must have been rapid; but we may be sure that a very great increase has taken place, perhaps least of all in Russia and the south-eastern countries of Europe, which have remained almost purely agricultural, as compared with England, France, and Germany; but nowhere an unimportant increase.

These figures, I may say, are not wholly in the air. They are supported by records of the acreage and production of crops, the census of the manufacturing population and of factories, the records of entries and clearances of shipping, the movements of imports and exports, the growth of banks, and similar statistics. To show only what is meant, look merely at such a fact as the

the probable numbers of the census of 1891 and 1901 on the basis of a representation of 660 for the whole of the United Kingdom:

	Population, in Millions.		Number of Members to Ireland.
	United Kingdom.	Ireland.	
1871	31·5	5·3	111
'81	34·9	5·1	96
'91	39·0	4·9	83
1901	43·5	4·7	71

production of iron in the United Kingdom. A century ago the output was estimated at 68,000 tons.* Last year it was about 8 million tons. The production of the world, which was probably a century ago as insignificant as in England, is now over 20 million tons per annum; that production being mainly the production of the European nations, or nations of European descent, we have been describing, and chiefly of the most prominent—England, the United States, Germany, and France. Similarly, as regards coal, the production in England at the beginning of the century was apparently over-estimated at 10 million tons or thereabouts, and it is now over 160 million tons. The entries and clearances of shipping again have increased since the beginning of the century in the United Kingdom about fifteen times. There is no doubt, therefore, about the increase of wealth, the facts, indeed, lying on the very surface of the economic history of the last hundred years. There are hardly data to put this increase into figures, very easily; though perhaps some approximation could be arrived at with care; while the increase of nominal values, it must be remembered, would not show the real increase of the quantities of things which has occurred, and that is the material point.

Similarly, as regards income, the income of the people of the United Kingdom a century ago could hardly be put at more than 200 million pounds, against more than 1,200 million pounds at the present time, a rise from 16*l.* to 35*l.* per head, while there have been similar changes in Germany and France, if there have not been equally great changes in Russia and other countries. Here again it has to be considered that nominal values are not everything. The range of prices is even lower than it was a century ago, so that the average real income must have more than doubled, if we assume that nominal values have doubled.

The fall of prices generally may perhaps be questioned; but the point is not really difficult. The facts are exactly known as regards wheat and such articles, while it is equally well known, as regards all articles of manufacturing industry—the manufactures from iron and coal, and the textile manufactures especially—that the cost of production has enormously diminished.

The more interesting question remains, whether anything can be affirmed to characterise the increase of population as regards the wealth of individuals and classes. I need not say to this audience that averages do not settle everything. Theoretically it is of course possible that all this increase of wealth in the past century may have arisen from a few rich becoming richer, the rest of the com-

* Porter's "Progress of the Nation," p. 270.

munity remaining as poor as they were, so that all the vast increase of population recorded would rather be of evil than of good omen, being the increase of a proletariat which starves in sight of the ever flowing increase of wealth. Nor am I sure but that this theoretical picture is imagined to be the picture of the reality by Socialists and some politicians who would disavow the title. But has this been the real character of the increase? The answer can only be given by statisticians, and without going into it fully at present, as it would make more than a paper by itself, I propose to summarise the main heads of the evidence, which have led every statistician I know of to the conclusion that this vast increase of wealth has benefited all classes, and that the increase of population in the last hundred years, in the leading countries at least, is an increase of a population which is better off in all classes from the highest to the lowest than the smaller population one hundred years ago. Every class, except the lowest, is more numerous, and the classes corresponding to those of former times are all richer.

By the necessity of the case, in a paper like the present, I can only deal with the broadest evidence. The broadest evidence is, however, the best—at any rate on the present occasion; the special object being to show the uses of the most common figures of statistics, it is desirable to restrict ourselves to figures that are easily accessible, or which can be easily demonstrated, or which are even comparatively well known, though their bearing is not popularly appreciated.

The first kind of evidence is to be found in the different studies which have been made as to the earnings and wages of the masses. I may refer to my own inaugural address in 1883 on the Progress of the Working Classes; to the papers published by the Manchester Chamber of Commerce, and the President of the Manchester Statistical Society; to the French official statistics of wages; to a book like that of M. Yves Guyot, containing numerous records of wages in England, France, and the continent, and in the United States; and to Mr. Jeans's paper read before the Society last year. The evidence of all these papers is that of a general rise of money wages since the early part of the century, in few cases of less than 50 per cent., and in many of 100 per cent. When properly studied, the evidence seems to me to point to a general rise of about 100 per cent.; the averages of one or two of the gentlemen, where a lower average seems to be brought about, not being properly deduced, because an equal weight is assigned to units which are obviously unequal. On this last point I may say I hope to produce some observations before long, as they form part of an unfinished paper which I was preparing for the Society last January, and am still proceeding with. But whether the average rise is 50 or 100

per cent., the broad fact of a great and general rise has been arrived at by every statistical inquiry that I know of, and is indeed beyond dispute. The only question as to the condition of the masses of the community having improved thus comes to be one of general prices; but on this head again the evidence is only too clear. The value of gold all round is as high or higher than it was fifty years ago, while silver is not much behind, the fall in silver as compared with gold being still less than 20 per cent.; while if we go farther back than fifty years, to the end of last century or the beginning of the present, prices are found to have been generally higher then than they were even fifty years ago. The direct investigations also bring out such facts as the diminished rate of general mortality and the increased consumption of the main articles of necessity and luxury which the masses consume, on all which I need not dwell, as they were the topics of my address the year before last. All I am concerned at present to show is that this direct evidence is practically unchallenged. There are questions as to the degree of improvement raised by some writers who are not accustomed to handle statistics, and who compare, for instance, the prices of some one year in a particular locality fifty years ago with the prices of some one year of the recent period, without attending to the general run of prices; but the broad fact of a great improvement is agreed to by every investigator. Such testimony is itself important in a question of evidence. The expert opinion being all one way, ought to carry some conviction to the popular mind, as it would in any other question.

The next broad fact I would refer to is the rapid increase of population itself in the last hundred years. Whatever may be thought of the doctrines of Malthus as to the increase of population being conditioned by the increase of the means of subsistence, few will dispute them in the form of an assertion that an increase of the means of subsistence is usually the accompaniment of an increase of population. There have been cases of an increase of population with barely an increase of the means of subsistence, as in Ireland before the potato famine, though it may be questioned whether even here there was not in ordinary years an increase of the means of subsistence per head, Ireland being made artificially prosperous by the Corn Laws, which gave the agricultural industry of Ireland, like that of England itself, artificial protection. But apart from special exceptions, we are justified in saying that a vast and rapid increase of population implies an increase of the means of subsistence among the masses who increase.

Next it is plain that a very large part of the increase of population has been the increase of a population better off than before, because this increase has been largely in the United States and in

English colonies, which have attracted the rudest and poorest labour from the old countries of Europe. Out of a total increase of 250 millions in the population of European descent in the last century, about one-fourth at least has been in the United States or English colonies, where the current rate of wages for rude labour is notoriously far in excess of what it is even now in Europe, and can hardly be put at less than three or four times what it was in Europe a hundred years ago. The rudest agricultural labourer in the United States receives about 20*s.* a week in money, besides board and lodging, which cannot be put at less than 10*s.* a week more. A hundred years ago, even in England, the agricultural labourer's wage was 7*s.* weekly, with wheat at 46*s.* a quarter; and even fifty years ago 11*s.* and 12*s.* a week were common wages, with wheat as high or higher. Fifty years ago, however, there is no doubt that the English agricultural labourer was considered better off than any of his neighbours on the continent or than Irish labourers, from all of whom the present American labourer is descended. It is certain then that the condition of the American labourer as compared with that of the European labourer a hundred years ago, represents an enormous advance in well-being. The improvement of the wages in a century, measured by this standard, is fourfold and more. Those who are left behind in Europe may not have improved so much, but those who have gone, and their descendants, have improved. The ebb and flow of emigration help to prove, moreover, that perhaps a nearer adjustment has been made between American and European standards than is sometimes thought. If the adjustment were not comparatively close, emigration from the old countries would tend to be steady and continuous in good and bad years alike, instead of being, as it actually is, intermittent.

The next broad fact I would refer to is the relative increase of town population in all the great countries. Substantially this increase is beyond all question due to the higher return to labour in towns compared with the country. Other causes may co-operate, but when we find a universal effect—in France, in Germany, in the United States—we may be sure there is a common and powerful cause, which cannot but be the superior remuneration of labour in the towns, as labour, like water, goes where it is best paid. The facts as to the increase of population in England, France, and the Continent are tolerably well-known; but it is not so well-known, perhaps, how, even in the United States, the very paradise of agricultural labour, the superiority of the towns makes itself felt. In his report as Superintendent of the last Census of the United States (Introduction to Compendium of the Tenth Census, p. xxxi) General Walker writes :—

"In 1790 one-thirtieth of the population of the United States

"lived in cities of 8,000 inhabitants and over; in 1800 one-twenty-
"fifth; in 1810 and also in 1820 one-twentieth; in 1830 one-
"sixteenth; in 1840 one-twelfth; in 1850 one-eighth; in 1860 one-
"sixth; and in 1870 a little over one-fifth. At the last date the
"inhabitants of cities numbered in all 8,071,875. It is probable
"that not only the absolute number, but the proportion of the total
"population resident in cities, will be found in 1880 to have still
"further increased. It will not be surprising if 12 million of
"persons, constituting a full quarter of the population, are living
"in cities of 8,000 inhabitants and over."

This was written in 1879 before the census of 1880, and the anticipations of General Walker were nearly realised. The town population in 1880, in towns of over 8,000 inhabitants, was 11,318,547, or 22·5 per cent—that is, about equidistant between a fourth and a fifth of the whole population, instead of being about a fifth only as in 1870. If smaller towns are included, the town population of the United States appears even more than a fourth, being in round figures 13 out of 50 millions.

The logic of these facts is clear. The increase of population in the United States being itself a proof of the general improvement of the masses of people of European descent, even assuming that we are only to compare the rude agricultural labour of the States with that of Europe, then if we find that the proportion of that rude labour, even in the United States, is diminishing and not increasing, that the growth of population is in the towns, we must raise still more our idea of what the average improvement of the masses has been. We ought not merely to compare the agricultural population of the present time with that of former periods, but in part we should compare town labour, which is still better paid, with country labour. As the town labour of the United States is also generally more highly paid than that of Europe, we have in this fact too another proof of the raising of the European standard. Here the adjustment between Europe and the United States is likely to be more complete than as regards rude labour, because town labour is more intelligent and mobile. In this enormous growth of town population then, that is of a higher class of labour, we see another proof of the magnitude of the advance of the masses. Not only is rude labour so much better off, as we see by the growth of the United States, but the proportion of that rude labour to the total is diminishing, and that of the higher classes of labour is increasing.

This last fact can be brought out still more directly. Classifications of the Census are often difficult to follow, changes being made from period to period; but in the last General Report of the Census for England and Wales, an attempt is made to throw light on this very question of the increase or decrease of "labourers," by

whatever term they may be called. The result is seen in the following short table which I extract from the Report (p. 37) :—

	1871. Corrected Numbers.	1881.
Agricultural labourers	962,348	870,798
General labourers	506,273	559,769
Railway navvies and platelayers	44,169	58,847
Road labourers	8,136	10,947
Total	1,520,926	1,500,361

Along with a general increase of population, therefore, between 1871 and 1881 in England and Wales, there was no increase of labourers so called. The increase in the working population, accordingly, must have been exclusively in the artizan classes, better paid than the labourers. Coupling such a fact with the increase of the town at the expense of the rural population, we have very strong additional evidence in favour of the idea of the vast improvement of the masses. The rude labour itself is better paid to the extent of 100 per cent. or more, but there is less in proportion of that rude labour than there was.

In this connection, also, the undoubted fact of the decrease of pauperism and crime becomes important. This decrease helps to demonstrate that the lowest class of labour is diminishing, not from any descent of the labourer into the class of the residuum (an extremely improbable thing we may remark, with the labourer's remuneration increasing) but from his ascent into a higher class. The proportion of the residuum itself, and even its absolute amount, is decreasing and not increasing, so that the lowest labourer cannot be falling into it. I cannot but express my astonishment, I may add, at the popular impression to the contrary which appears to prevail in many quarters. The old records are only too full of the violence and crime of a large class of the very poor, half mendicants, half robbers, as the statutes against masterful beggars, highway robbery, and the like, bear witness. That beggary in the old sense has all but disappeared is certain, just because the residuum of civilised societies is less than it was.

There is yet another statement to be made bearing on this point. Not only are the lowest classes of all diminishing in proportion and even in absolute amount, but it is equally certain that at the top of the scale the proportion of society receiving moderately high incomes is increasing. I may take leave on this head to refer specially to the table printed at p. 24 of my inaugural address on "The Progress of the Working Classes," showing the

increase of the number of persons at different amounts of income charged under Schedule D. The increase in incomes from 150*l.* upwards was there shown to be from 106,637 to 320,162 between 1843 and 1880, or three times the increase of population in the interval—we are speaking of England alone—being only from about 16 millions to 25½ millions, or 60 per cent. The indication clearly is that a general translation of classes has been in progress—that the lowest classes of all are diminishing and the highest increasing. It is of course just probable that the average income of the intermediate classes may not have been increasing along with an increase of its numbers through its being recruited from below, but such a movement, I need hardly say, would be extremely improbable, being contrary to the direction of the movement as observed both at the bottom and at the top of the scale. It is here, moreover, that the direct evidence of statistical investigators applies. It is the artisan wages, according to their accounts, that have decisively increased. In any case the average income of a society composed in an increased measure of artisans has to be compared with a society in former times in which labourers bulked more largely. The wages of the artisan may not have increased in proportion, though the direct evidence is that they have increased; but at any rate there are more artisans relatively than there were who are all much better off than the labourers, whose condition at the same time has undoubtedly improved.

Before passing from this point I should like to supplement these figures by a reference to some statistics as to inhabited houses. There are certain difficulties in the way of comparison at distant dates; still, there was a house duty between 1812 and 1834, as there is a house duty now; and although the bases are changed, the following comparison, I believe, may be taken as approximately correct:—

Comparison of Dwelling Houses and Annual Value in Great Britain in 1833 *and* 1880, *according to the House Duty Returns.*

	1833.	1880.
	No.	No.
Houses above 20*l.* annual value	215,000	713,000
,, 15*l.* and under 20*l.*	228,000	425,000
,, 10*l.* and under 15*l.*		755,000
Houses under 10*l.*	2,252,000*	3,091,000
Total	2,695,000	4,984,000

* This figure is arrived at by deducting the houses subject to duty from the total number of inhabited houses.

Here the total increase of houses is between 85 and 90 per cent. as compared with an increase of population in the interval of about 80 per cent.; but the increase of houses under 10*l.* annual value is less than 40 per cent., or about 800,000 in number altogether. On the other hand the increase in houses between 10*l.* and 20*l.* is no less than 952,000 in number—more than the increase of houses under 10*l.*—and the percentage of increase is over 300 per cent.; and the increase of houses above 20*l.* annual value is about 500,000, and the percentage of increase is about 230 per cent. There has accordingly been quite a disproportionate increase of houses above 10*l.* annual value, showing that there has been a translation of classes into houses of higher annual value. We have not the details for houses under 10*l.*, but the presumption is that while the total increase is under 40 per cent. the increase has been at the top and not at the bottom of the scale. These statistics are of course open to the argument that increase of house rent is a proof of the increased cost of living, and not a proof of better accommodation for the inhabitants; but the argument is self-contradictory. The wages of labour being ultimately the main element in the cost of producing houses, the increased rent, if it is a sign of the increased cost of producing houses, becomes a proof that the wages of the builders of houses have increased—probably that they have greatly increased, seeing that in various directions labour-saving machinery has been introduced and the cost of production has thereby been diminished. On the other hand, if wages have not increased, or if they have not increased more than by the amount of the savings effected in production, then the increased house rent implies enormously improved accommodation. The latter hypothesis appears the more probable; but in either case an advance of the masses is demonstrated.* That much higher rents are paid is a proof of the rise in the scale of living. The figures fully confirm the inferences to be drawn from the increase of incomes liable under Schedule D already referred to.

The evidence is thus cumulative. In addition to the direct evidence of statisticians who have investigated the subject, and who find a general improvement among wage earners, the masses of the community, it appears that the great facts of the time—the rapid increase of population itself; the special increase in the United States and in the colonies, where the masses are better off than the masses in Europe; the relatively greater increase of the town population; the diminution of the lowest class of labourers, coupled with an increase in the remuneration of the

* Much stress is laid upon competition in towns as the cause of the rise of rent; but the bulk of the houses are of course so situated that the element of ground rent counts for very little in the general problem.

class and with a diminution of crime and pauperism; and the increase of the workers at the top of the scale, as shown by the returns of the income tax and of house duty,—all point to the one conclusion that there has been a great increase of well-being throughout all classes of society, the numbers of the better-off classes all increasing, and of the lower classes and of the residuum diminishing. We may thus conclude that the vast increase of wealth and resources, which has undoubtedly taken place in the last century, has not been an increase for the benefit of a few, but that all classes have participated, and not least the artisan and labouring classes, the masses of the community. At least, this is true of England, France, Germany, and the United States, about which we know most. To a less degree, however, we may assume, there has likewise been an improvement in Russia and the rest of Europe. Like causes produce like effects, and these communities must all be influenced in the same direction by the general improvement in the neighbouring communities. In other words, then, the vast increase of population with which we have been dealing is an increase of population which is generally improving in well-being, the improvement in some large parts of these masses being literally immense.

It is unnecessary perhaps to do so, as no figures on the subject can be very exact, but it may be useful to endeavour to state numerically the masses of the different classes of modern society, in order to give some notion of the magnitude of the change from former times. Using the figures as to house duty already given,* and allowing 7 persons per house in houses above 20*l.*, 6 persons in houses between 10*l.* and 20*l.*, and $5\frac{1}{2}$ persons in houses under the 10*l.* limit (so as to allow for farmhouses, &c., not included in the dwelling houses so called), we should classify the population of Great Britain in 1880 as follows:—

	Number of Houses.	Number of People.
In houses above 20*l.*	713,000	5,000,000
,, 10*l.* and under 20*l.*	1,180,000	7,000,000
,, under 10*l.*	3,091,000	17,000,000
Total	4,984,000	29,000,000

Making some addition to these figures so as to include Ireland,

* It should be explained that the number of houses dealt with here is smaller than the number as given by the census, and allowance is made for this in giving an average number per house in the following calculations. For the purposes of this paper it is unnecessary to explain the causes of the difference in numbers of houses between the dwelling-houses of the house duty returns and the inhabited houses of the census.

viz., one-tenth to the population in houses above 20*l.*, one-seventh to the population in houses between 10*l.* and 20*l.*, and nearly one-fifth to the population in houses under 10*l.*, we should get the following classification for the United Kingdom, as for the year 1880 :—

In houses above £20	5,500,000
,, under £10 and above £20.....	8,000,000
,, under £10	20,500,000
Total	34,000,000

In other words, the population living in houses above 20*l.* rent, is very nearly half the population living in the country a century ago; it is more than the population of all England, according to the best estimates, in the time of William III, and it is more than twice the estimated population of England at the beginning of the fifteenth century after the Black Death had been recovered from. In other words, there is a whole nation within the United Kingdom living in circumstances which are better than those of even the highest classes down to a quite recent period. The highest class is in fact to be counted by millions, where it was formerly counted by thousands. There are no doubt many grades among the people living in houses above the 20*l.* limit, and the standard of living has been so raised that there is a new highest class—an upper ten—which is only a small percentage of the people living in houses above 20*l.*; but the actual comforts and surroundings of people who live in such houses are the things here in question, and in command of the means of civilisation, of real comforts and luxuries, the people in such houses undoubtedly excel the upper ten of a former time.

The class below this amounts to 8 millions, a rather larger nation—two-thirds of the whole people a hundred years ago, 50 per cent. more than the whole population of England in the time of William III, and nearly three times the population at the beginning of the fifteenth century. If we allow that the class in houses above 20*l.* comprises, as a rule, the lower middle class, though there are certainly some artisans included, then we may say that the upper classes of artisans, and the smaller farmers and shopkeepers, are generally in the houses between 10*l.* and 20*l.*, with incomes from all sources of over 100*l.* per annum, allowing that rent is about a seventh or eighth of the income. I cannot help thinking that these masses compare very well with the yeomen, the freeholders and farmers, of former times. Many of them, in fact, in opportunities of civilisation and healthy conditions of life are on a par with all but the very highest classes in former times.

Coming to the class in houses under 10*l.*, about 20 millions in all, I should say that if we deduct about one-fourth for the lowest class of labourers and the residuum, which I consider an ample allowance, there would remain 15 millions of people whose conditions of life are still tolerably satisfactory—the inferior army of artisans and the better class of unskilled labourers. I hardly think that if we look at the cheapness of commodities and the opportunities of education, this class can be considered much inferior to the yeomen of former times all round—certainly they are not inferior to the masses of mechanics and labourers of any former time. Of course the existence of the mass of 5 millions below is a stain upon our civilisation. The actual "residuum" may be very small, but there are still too many of the very poor. Even the very poor, however, are undoubtedly better off than the very poor of former times; and it may be doubted if they are more numerous than they were a century ago, when half the people of the United Kingdom—it must be remembered that Ireland and Scotland are included as well as England—were in that category. In the time of William III, Gregory King estimated that more than half the population of England at that time was very poor, and either wholly or semi-pauperised; although population increased, there was certainly no great improvement on this state of things down to about the time of the French revolution.

Thus the society of modern times, taking England as a model, includes an upper class quite as numerous as the whole nation at a very recent date; a class of superior artisans, small farmers, and shopkeepers even more numerous than the first, and living in greater comfort than the so-called middle-class, the yeomen of former times, which was only a small part of the community; and a class of inferior artisans and labourers, more numerous still, occupying the place in society of the poor of a former time, the mass of the community then, but approaching the former middle-class in its conditions of living; finally, an inferior class, the smallest of all, corresponding to the very poor and the residuum of former times, but the residuum now included being very small, and much smaller in proportion than it was. Not only then have modern societies increased mightily in numbers, but the wealth has been diffused very largely. The mass of the well-off far exceeds the whole population of very recent times.

Before coming to a conclusion, let me add one more remark by way of explaining a peculiar misapprehension of these figures as to wealth and income, which perhaps helps to account for the socialist version of modern society as an exploiting of the poor by the rich, and the readiness with which that version is accepted.

The misapprehension is not unnatural. See, it is said, how the community of England produces 1,200 million pounds a year, but the "workers" only get a fraction of this sum. The notion is thereby created that the labourers so-called produce the whole 1,200 million pounds, and that "others" consume the larger part. In actual fact, whatever may be the truth as to the division of national production among different classes, and whatever that production may be, the estimates of national income are not available for such comparisons. Income is not identical with production in the sense understood by Socialist agitators. Look only at the way it is composed. Sir Frederick Leighton, Mr. Millais, Mr. Orchardson, Mr. Alma-Tadema, and many more paint pictures. Their incomes of 2,000*l.*, 5,000*l.*, 10,000*l.* and possibly in one or two instances even larger amounts go into Schedule D and make up a part of the 1,200 million pounds which excites the envy of the socialist. The physician's, the lawyer's, the engineer's, the architect's and others fees, all fall into the same account. The "wages of superintendence" of the capitalist who administers his own capital, often a very serious business, also make part of the same sum. It is quite manifest then, that whether the things which these workers produce are of value or not, the people who produce them are not the proletariat but the very people who make the return to the income tax. Other workers, in claiming a share of that income, are claiming a share of what workers like themselves produce. Out of a total sum of 576 million pounds returned to the income tax in 1879-80, no less than 165 million pounds returned in Schedule D as that of trades and professions was of this character, —*i.e.*, it was the production of the very people who were charged, and the value of it was paid to them as wages. Similarly, the farming income returned under Schedule B was very much of the same character, the farmers earning the 70 million pounds credited to them, not as capitalists, but largely as workers.

On these and other grounds I concluded in my address on "The Progress of the Working Classes," that the total income of capital in the United Kingdom could not be put at more than 400 out of 1,200 million pounds, or one-third of the total, and I am inclined to think this sum much above the mark. In any case, in a question as between labourers and capitalists, the fact has to be kept in mind as to what the composition of the 1,200 million pounds really is. The masses of workmen in no sense are the producers of that value—they may be of opinion that what they do produce should be valued at that sum, artists and other highly paid workmen having their productions valued at less; but in actual fact there is a large amount of production by workers which is not theirs.

What is perhaps still more important, the classes engaged in this highly paid production very largely exchange among themselves. The architect, or surveyor, or merchant, pays high fees to the physician or lawyer; all of them in turn pay high fees to masters and tutors for the education of their children; the capitalist who receives a high rent for his houses, in turn pays it away to the lawyers, doctors, or other professional men who live in them. It is sometimes supposed that in this way income is counted twice over and more, but in strictness income is counted only once; only what we get, when we have the sum of all, is merely the addition of the sums at which the different classes of the community exchange their services with each other, and it does not follow that there is a general fund of production to which all contribute, and which can be divided. The services are now exchanged in part between small groups in society, and such exchanges, counting very largely in the aggregate, go to swell the total; but to some extent the whole thing is merely nominal —it pleases those concerned to count them for so much, and that is all. There is no corresponding "production" to be divided.

Much the same may be said of the superior class of artisans. The good things of which they obtain command by their labour are not the things which the masses of unskilled workmen produce, but the things which they and others of their own class produce. The exchanges are mutual, and the masses of inferior workmen are out of it altogether. It is probable besides that as the consumption of every worker approaches very nearly his production, the condition of the production itself is that the worker should have an equivalent to consume. Strictly speaking he could not produce at all at less wages than he receives. An artist or an author requires a certain medium; the "production" of a clever engine-driver or other superior artisan would equally be impossible unless with a certain command of food and other commodities; their nerves and brains would be unequal to the strain.

The dream of the socialist that there is a common fund produced of which certain workmen do not get their fair share is thus a pure illusion. The producers, to a larger extent than is commonly supposed, are the consumers, and the production is a function of the consumption itself. As to the share of the capitalist, I am old-fashioned enough to think that capital and property are good institutions, that a leisured class in the community, such as the saving of capital makes possible, is not a bad thing; but apart from this, it is also quite clear that capitalists even now only earn their income by assisting the different producers, whose exchanges are principally with each other, and the toll they levy, if the return to

capital is to be called a toll, is not levied on the produce of the workers who are least paid, but on the produce of those who are paid highly. It is the highly paid who use, and who can use, the most machinery, *i.e.*, the most capital, and who have themselves cost the largest sum to become efficient producers. The unskilled labourer cannot work the machines which are essential to modern production; if left to himself he would be unable to carry on the production; it is his misfortune, if not his fault, that he is so poorly equipped as to be able to produce so little.

The point has also been insufficiently attended to, I think, that the income of capital is largely not spent by the capitalist classes so called. The bulk of it is saved, and gives rise to the employment of labour in another way. Mr. Atkinson estimates that hardly a tenth part of the production of the United States is consumed by the owners of capital, and although the proportion in this country is perhaps larger, I doubt if it is very much larger, although the nominal income of capital reckoned by the income tax returns appears to be a third or a fourth of the total income of the country. How essential the reinvestment of capital is with a growing population need hardly be dwelt upon, and it is a proof of the compensations that are to be found in the natural order of modern society, that the very excess of private capital leads to enormous reinvestments, with increased employment for labour, and a diminution of return to the capitalist himself.

I trust this digression will be found not out of place. It seems to follow naturally from a discussion of the general progress of European society in population and wealth. It helps us to understand, I think, the nature of the modern industrial organisation, with its vast masses of highly paid workers, many actually highly paid in absolute amount, and almost all highly paid compared with former times, and to whom the capitalist is really only a servant, though he seems to be master. Passing now to a conclusion, the first question to ask appears to be as to the causes of this vast development of numbers and wealth in modern times. There is nothing like it in past history. England, with about $2\frac{1}{2}$ millions of population in the fourteenth century, about the time of the Black Death, had still no more than 5 millions at the end of the seventeenth century. France, which was larger and richer, was more populous, but in the two hundred years preceding the end of the seventeenth century the population only doubled. Russia, in like manner, had less than 6 millions when it begins to be noticed in the fifteenth century in European annals, and two centuries after it had only 14 millions. In other countries there was equally slow progress, down to about the end of the seventeenth century, while in the century following, although a start forward was made, the

progress was slow compared with what it has since been. An increase like that of the United States, from 3 to 60 millions in a century, is altogether unexampled, and this increase, as we have seen, is only part of a larger movement. It cannot but be interesting to understand, therefore, what are the causes of this remarkable development, and in view of the increase of population still going on, whether these causes are likely to be permanent.

There are four causes which appear all to have contributed very powerfully to the general result, and which have acted and reacted on each other.

First and foremost I would put the growth of strong central governments, covering large areas, with power to put down all minor disorders, though they were themselves, for the most part, militant governments. To some extent England began to benefit from this cause not long after the Norman Conquest, but certainly not all parts of the United Kingdom, Ireland and Scotland especially being subject to local disturbances and wars down to a very late period. In France again the start forward in prosperity begins with Louis XIV, who was strong enough at home while militant abroad, and who was only strong abroad because there was peace at home. Russia begins to advance rapidly again from the time of Peter the Great, that is, from about the end of the seventeenth century, the effect in Russia being doubled by the peace at home and by the strength of the Government to drive the Turks out of the rich southern provinces and so to gain these provinces for settlement. The establishment of a strong Government in Prussia at the beginning of last century is also coincident with greater peace at home, although the Prussian monarchy was militant enough. There have no doubt been great wars during these hundred years, and in some parts of Europe these wars were most destructive at long intervals; the military budgets of the Great Powers have also been enormous, and have given rise to incessant complaints and apprehensions; but the internal peace appears to have compensated all the evils of militarism on a large scale, and to have given the nations time for the arts of peace.

As the view is somewhat different from the common one, I may be permitted to point out also that the period of actual war, if we take any one nation separately, and especially if we take any one country as being itself the seat of war, has been much less than is commonly supposed. To take Prussia, for instance, it would strike most people with surprise, I think, to be told that Prussia has only been in a state of war for about three years during the present century, although Prussia, now Germany, is *par excellence* the military State of Europe at the present day. Yet this is the literal fact. The Jena campaign in 1806 lasted a few months only; the campaign

with the Allies only lasted about a year, from the battle of Leipsic in 1813 to the overthrow of Napoleon the year after; the Waterloo campaign was one of four days only, and the state of war had lasted but a hundred days; the Danish war in 1864 was also short; equally so the war with Austria in 1866; and finally the war with France in 1870–71, from the declaration of war in July, 1870, to the capitulation of Paris in January following, was one of hardly more than six months. The record of Austria is almost as clear of the actual state of war. One short campaign in 1800, ending in the defeat of Marengo; another short campaign in 1805, ending with Austerlitz; another campaign in 1809, ending with Wagram; a year of fighting in 1813-14; a short war with France and Italy in 1859; and finally the Danish war and the war with Prussia in 1864 and 1866—make up the Austrian account. The state of war during the present century has not lasted five years, even if we throw in the war of the Hungarian revolution in 1848-49. The Russian account is less clear, but even in the case of Russia there have not been ten years of European warfare. As regards France and England, which were engaged for an exceptionally long period in warfare, beginning after the French revolution, and lasting with little intermission until 1815, the peculiarity was, with the exception of a short period of invasion in France by Prussians and Austrians after the French revolution, and another short period in 1814, that neither country was the theatre of war. Both countries were left entirely free for industrial development at home. In a certain sense Europe for a quarter of a century before 1815 was involved in war, but the theatre of actual fighting was constantly shifting, and it is not true that Europe was ravaged by war the whole of that time.

The conclusion is that although it may not be true to say that the last hundred years have been more peaceful than any former period of European history, yet the constitution of strong central governments has diminished the actual area of warfare, and the actual duration of the state of war so sensibly as to give far more time than in any former age for industrial development. I think it is possible and probable that under the new conditions, with boundaries well settled, and the Great Powers conscious of the mischief they can inflict on each other, and the little gain they can hope for in war, the limitations of the area of warfare and of the duration of the state of war will continue and even increase.

The next cause of the rapid improvement in population and wealth in the last hundred years appears to have been the great advance in practical agriculture which took place in the course of last century. I must speak with diffidence on such a subject; but in England at least the improvement of the breed of cattle,

the introduction of root crops and winter grasses, and later on systematic and more skilled drainage, coupled with the enclosure of common and waste lands, appear to have combined to increase greatly the agricultural production of the country. Such improvements would not be confined to one country, but would of course spread, and Continental writers accordingly record a great increase of agricultural production during the present century. Of course there could have been no such improvements without internal peace, the one cause thus co-operating with the other.

As a third cause I need only note that to last century belongs the steam engine and other inventions and the beginning of a vast development of manufacturing, which has since been coincident with the vast increase of population.

Finally, and not less important than any, there has come the discovery and opening out of new lands in the west of North America, in Australasia, and in South America, suitable for European colonisation, Russia having been already provided with a similar field at home, which it obtained the practical use of last century by expelling the Turks. This opening out of new and fertile land has certainly been a godsend to the European race. Coming as it did at the very time when internal peace and discoveries in arts and manufactures were stimulating the growth of population, it has provided an outlet for rude labour, which has, along with the other causes in operation, removed every external check to an increase of population and wealth. But for these new and fertile lands, it is impossible to imagine how the recent development could have taken place. A check must have come from somewhere, and the masses could not have been so well off as they are now.

Will these causes or conditions be permanent or not? So far as can be judged, three of them may be, but the last is necessarily transient. The great nations may continue peaceful; agricultural production may go on improving; the development of inventions and manufacturing may also go on almost indefinitely. So much cannot be affirmed with certainty. It remains to be seen whether the human race has power to maintain so complex an industrial organisation as we possess, so dependent on scientific knowledge of every kind, and making such heavy calls on brain and nerves, along with a steady and enormous increase of numbers. How can we know beforehand that the proportion of skilled labour necessary for the very existence of such a society will be maintained? But while there is a possibility so far of existing conditions being maintained, it is equally certain that the power of resorting to new lands is rapidly being lost. If population increases at all at its present rate for only another century, the habitable

earth available for European races will be filled up as the existing territory they occupy is already filled up. The race accordingly will have to depend after an interval which is very brief in human history on the power of increasing production from the same soil, and not on the resort to new lands. So great a change must affect materially the whole conditions of the recent progress.

It is impossible not to revert in such a connection to the Malthusian theory. Malthus is thought to have been discredited because he is supposed to have asserted, writing at the beginning of the century, that the population of the world, and particularly of England, would not in fact go on increasing, as it really has done, because there would not be means of subsistence. Malthus, however, had made no prediction in the strict sense of the word. He had drawn out from experience that the human race tended to increase faster than the means of subsistence, its natural increase being in geometrical ratio, and the increase of its means of subsistence in arithmetical ratio only; so that population had only been kept down in past times by war, famine, and disease as the consequence of famine. He was bound to anticipate that a continuance of the process would expose the race once more to the operation of these natural checks or to a descent of the masses in the scale of living, or to both these evils. That in fact the new experience has been different from the former one, and owing to various causes the means of subsistence have increased faster than the population, even when increasing at a Malthusian rate, is no disproof surely of the teaching of Malthus. His statistical inquiries into the past remain as valuable as ever. If the causes of the new experience have been transient only, and one of them at least has been transient, while we do not know how the future will shape itself as regards the others, then it is not quite so certain even yet that the gloomy anticipations of Malthus were wholly misplaced. A struggle by large portions of the race against a fall in the scale of living may not be so far off as it appears.

In one respect at least Malthus has been confirmed by the event. Among all the illustrations he was able to give of the tendency of the human race to increase with an increase of the means of subsistence, he could adduce nothing so colossal as the experience of the last hundred years. On this head he is fully justified. Here again the experience may change in time. The race may change in some vital characteristic as that of France seems to have changed, at least in France itself, for the Canadian French increase rapidly enough. Until the present time, however, the experience since Malthus is almost uniform as to the tendency

of the race to increase when there is abundance of food and wealth.

Meanwhile, outside of these speculations, it is impossible not to regard these vast agglomerations of human beings under single governments from another point of view. May they not be changing entirely the essential constitution of governments, the character of politics, and the range of political action? Not only must this question be answered in the affirmative, but the answer must be of a kind, I think, which will surprise some of our active politicians. The change that is happening is not merely that governments are becoming democratic, as the phrase is. The governments themselves are becoming powers with a limited range of action only, because the vast complexity and play of interests in modern societies place it beyond the power of the ultimate authority to interfere intelligently, except within the very narrowest limits; and because the old purposes for which governments existed—the maintenance of internal order, the punishment of crime, external war, the regulation of successions to property, the teaching of religion perhaps—are some of them falling more and more into the hands of voluntary agencies, and are partly becoming—through the ease with which they are accomplished, and for other reasons—less important relatively than they were to the general interests of the community. The mere fact, for instance, that in the United Kingdom the central Government now spends annually about a twelfth of the national income, whereas at the beginning of the century it spent about a third, shows how much smaller a factor government is in the national life than it formerly was. At the same time crowds of interests have grown up for which there are voluntary associations answering in many respects the ends of government, but more or less wholly dissociated from the central Government itself, and very little regulated by it. The public companies, the learned societies—all do things of a kind which governments were once expected to do, but which society for the most part now does for itself. Local government also has become not so much an extension of national government as a species of voluntary association, administering for localities in certain matters, such as gas and water, just as other authorities, if I may call them so, without being thought of as part of the government at all, administer the far more important interests of the railways. As a consequence, the general interest of people in the affairs of government, and in political action, is declining, because private affairs and public and semi-public interests of a non-political kind are more engrossing. Under the changed circumstances politicians can hardly be

at the top of business as they once were; they are a department of the general organisation of the community, and not the organisation of the whole community for all common interests as was once the case. The chief interest now attaching to politics is that as politicians have power—the command of national resources—they may cause great mischief; but the time is long past since it has been in their power to do much good by what is called constructive action. The community goes its own way in trade, in science, in religion, in amusement, and hardly cares what politicians may do or not.

In essentials the form of government adapts itself to this change. Formally the nation chooses its Parliament and so its Government. Practically the choice is somewhat like the choice of leaders in other public matters—a self-choice on the part of a few who devote themselves to the business as a business, and who get to the top just as the directors of a large company get to the top, the public taking a languid interest in the matter, and allowing itself to be led. But the business of getting elected and keeping foremost is itself so arduous, just because of the vast increase of population, that any power except for mischief when they do govern is necessarily taken away from those who engage in the struggle. They have not time or strength to govern if they would. As nations increase in numbers, these difficulties must increase, and the sphere of government must be proportionately reduced.

In conclusion, I ought perhaps to apologise for having been tempted so much into political speculation by the consideration of some of the most common facts of statistics. My excuse must be the fascination of the topics, and the hope that some good may be done to our cause by showing to the public, and especially to the younger generation, the profound importance and interest of the aspects of social and economic progress which statistics present, and which could not be perceived at all without statistics. In the course of time, as statistical records are maintained, problems of the same kind as those here discussed must be presented for discussion with increasing clearness, and statistical ideas of society and social progress must more and more permeate the literature and philosophy of the time.

Discussion *on* Mr. Giffen's Paper.

Mr. Hyde Clarke said it was due to a paper of so much interest as that of Mr. Giffen, that some words should be said respecting it. In the few remarks he proposed to make he would not speak in praise of the paper, but would rather devote them to a certain extent to criticism. He spoke in the presence of a very distinguished ethnologist, who was sitting by his side, and who was aware of the difficulties that existed in dealing with the matter such as that dealt with in Mr. Giffen's paper. It was impossible to accept the form in which Mr. Giffen had laid the matter before them, which went to the basis of the subject, and the conclusions which had been drawn. The term Europe or European was purely artificial; but on that subject he would reserve his observations until some future occasion, when he hoped an opportunity would be afforded of discussing Mr. Giffen's paper more fully. There were many points to which reference might be made, but he would only call Mr. Giffen's attention to one of them. The matters which he had discussed were now no longer regarded as matters of race, but rather of culture. Culture, as for example language, was more abiding as an element in the operations of civilisation than even the influence of the race. With reference to the English part of the subject, he would remind Mr. Giffen that instead of the term Anglo-Saxon races it was now customary to use the term English-speaking races to define that great element of 100 millions of English-speaking people which exercised so great an influence on the political condition of the world and on the elements of civilisation and progress in the present day, that portion which had had so much to do with those events of which Mr. Giffen had in many cases given so graphic an illustration. In justice to Mr. Giffen he desired to offer his tribute of admiration for his labours.

On Uniformity *of* Statistics.

By J. S. Jeans, Esq., F.S.S.

The subject which I have undertaken to bring before you on the present occasion is one of such very wide scope that it is impossible to deal with it, except in the most general way, in the brief space of time at my disposal. Nor is it necessary perhaps that it should be exhaustively dealt with, even if that were easily practicable. The majority of those who compose this audience are, I take it, fully acquainted with the essential differences that distinguish the methods of compiling the more important statistical *data* common to most civilised countries. No statist can have had occasion to compare and collate the statistics of any number of different nations without having marked, and been struck and perplexed by, the want of uniformity by which they are distinguished, and thus being constrained to desire that the gentlemen who are responsible for the collection of the facts that make up the sum of our periodical additions to statistical knowledge could agree upon the precise *data* that require to be tabulated and the methods of their tabulation. If the present meeting should succeed in advancing in any degree this desirable object, it will have done good service to statistical science.

The subject of the present paper naturally divides itself into two different but cognate branches, viz.:—

1. The uniformity of such statistical *data* as are common to all civilised countries; and
2. The uniformity of statistics relating to the British Empire alone.

Under the first of these heads, we have to deal with returns that may be conveniently grouped under the four several divisions of—

a. Monthly returns.
b. Annual abstracts.
c. Biennial or triennial compilations; and
d. Decennial or census returns.

To the first of these four divisions belong the most important and valuable of all statistical returns—those relating to imports and exports, vital, meteorological, and other *data* collected at short and regularly-recurring intervals.

The second division—annual abstracts—comprises summary statements of all the more important statistics collected and used for legislative purposes, both local and imperial. To properly fulfil its function the annual statistical abstract should be a *vade mecum* of the facts required in every-day work by the politician, the economist, the administrator, the publicist, the journalist, the merchant, and indeed every class of the community who require to consult the figures that record national progress or regress. It should be neither more nor less than—

"The story of our lives from year to year,"

presented in the most compendious form possible, and embracing the greatest attainable variety of subjects. The complexity of the details contained in a statistical abstract renders it difficult to issue it at shorter intervals than a twelvemonth, and as the information which it contains is often necessarily very much behindhand, it is too frequently a species of ancient history, valuable only for purposes of reference to those whose business it is to consult

"The abstract and brief chronicle o' the time."

The monthly return, on the other hand, deals with facts that are immediately past, and which are capable of exercising a vital influence on the circumstances and tendencies of the immediate future.

It would probably be impossible to convey a better idea of the differences that distinguish the monthly return from the annual abstract than by comparing the publications issued by our own and other Boards of Trade under these heads. In order to effect the most speedy issue practicable, the monthly return of our exports and imports is necessarily limited in scope. The quantities and values of the principal articles imported and exported, and the principal countries from which such articles are received, or to which they are sent, are separately ascertained and recorded, but there is a very large residuum of every commodity of which no such detailed particulars can be given in the monthly return, because the specific tabulation of such particulars would necessarily greatly increase the labour involved, and the bulk of the document, as well as delay publication, which is a thing on every ground to be avoided. In the annual statement of trade and navigation, however, the deficiencies of the monthly return are rectified, the fullest possible particulars of every item of export and import being recorded, as well as other *data* which belong to the subject, and are necessary for its full elucidation.

Even, however, in a document so venerable and revered as the monthly returns of the Board of Trade, changes are constantly

being made under the name of "improvements," thus proving that in statistical compilations, as in the phenomena of nature, there is no finality—no stage at which we can properly "rest and "be thankful." Quite recently, the system of tabulation adopted in this return by the English Board of Trade was considerably modified, with the view, as it appears, of more clearly distinguishing between raw materials and manufactured commodities. Most of us will probably agree that this was a step in the right direction, but it is one, nevertheless, that has exposed its authors to a considerable amount of hostile criticism, as tending to break the uniformity of a long series, and to create at least some temporary confusion. The best system of tabulating trade returns is still very much a matter of dispute. Some statists prefer the method of tabulation by countries, others by alphabetical order, &c. But it surely cannot be claimed that any such return is statistically complete unless it distinguishes between the different varieties and quantities of raw and manufactured materials, so as to allow of the relative as well as the absolute proportions of each being readily apprehended and compared, and for this reason, I, for one, should hail with much satisfaction the general adoption of the recent modifications introduced by our Board of Trade. It is of the very highest importance that such returns should at a glance convey just impressions of the position occupied by the countries dealt with in reference to the increased or decreased imports of raw materials and the increased or decreased exports of manufactured commodities. By such criteria, the conditions under which national industry are being pursued can be most readily appreciated, and the differences that distinguish one country from another estimated at their true worth.

I have compiled a statement (see Appendix) of the principal contents of the annual statistical abstracts issued by the leading European countries, whence it will be seen that, in regard to the scope and character of the information tabulated, there is already a great deal of uniformity established. All alike contain *data* relative to territory, population, imperial finance, banking, education, military affairs, imports and exports, agriculture, railways, postal affairs, industry, commerce, and crime. But each has, at the same time, characteristics more or less peculiar to itself, while most of them differ in regard to the character of the facts tabulated, and the method of their tabulation. We find, for example, that all the European countries embraced in the table contain statistics of "public worship," or "religion," except our own, which will probably strike as being curious those who remember Caraccioli's reproach, that "England has sixty different "sects, and only one sauce." The English abstract, however,

probably compensates for this defect, if defect it be, by the fulness of its statistics of "average prices," as deduced from the declared value of imports of commodities—a description of *data* which, if recorded in the same way in other abstracts, would go far to settle the often debated and seldom rightly appreciated subject of the differences in the cost of living as between one country and another. The Austrian return alone gives statistics relating to the newspaper press; while Prussia is unique in its returns of chambers of commerce. Italy and Belgium publish statistics of charities, Prussia, Austria, and Hungary returns relating to public health, England and France, customs' tariff statistics and England, Italy, and Prussia distinguish themselves by including returns of local or communal taxation.

For the purposes of this paper, it is not necessary that I should make special reference to returns that are collected and issued at longer intervals than a twelvemonth.

Although there are so many subjects of statistical inquiry that are more or less common to all European nations, there are very few with respect to which the facts tabulated are precisely the same, so that there is a very necessary and important distinction between uniformity of subjects and uniformity of facts. Certain leading facts are, of course, almost necessarily ascertained and recorded. It is in the minor details that the discrepancies arise, and these are often so serious as to vitiate seriously the value of the major returns. In reference to census returns, for example, the numbers of the population, and the proportions of males and females respectively, are always recorded; but from this point the returns begin to vary, until, when we come to examine the statistics of occupations, we find that no two census reports are alike, and, what is still worse, it seldom happens that two consecutive census reports can be found without serious variations, even for the same country. Railway returns, again, are of a character that lend themselves perhaps more readily than almost any other to absolute uniformity of methods and facts, and yet they are seldom found to be compiled on the same lines for any two countries. In all cases the extent of railway opened for traffic is recorded as the major fact, together with the total capital cost;* but beyond this there is not sufficient uniformity to allow of a comparison being made on any one of the many points involved in railway administration, as between the different leading countries of the world, while in reference to one at least of those countries, the compilation of this most important class of statistics is left to

* In one or two cases, however, as in that of Russia, this fact is not ascertainable.

private enterprise,* happily, as it happens, without detriment to their value. Industrial statistics supply another case in point. In nearly all European countries returns of the production of minerals are now made compulsory; but in the United States this work is still left to voluntary agency. In some cases such returns, in addition to the quantities of minerals produced, specify their value at the place of production, the number of collieries or mines, both operative and idle, the number of hands employed, distinguishing males from females, and children from adults; the number of days worked per year, and the amount paid in wages. But with reference to each and all of these points scarcely any two returns are alike. It is the same with the statistics of metallurgical produce. Nearly all European countries are alike in having these collected by the State, but in some countries, as in our own, the State collects returns of the make of pig iron, and lets alone manufactured iron and steel; while in the United States the collection of both is left to voluntary effort. Among minor differences, it may be noted that while some countries collect returns of the consumption of ore and fuel, of the amounts paid as wages, and of the number of hands employed, others do not; and it is not quite satisfactory to be compelled to add that returns of the two latter items, and of several others of equal value, are not available for our own country.

Before leaving this part of my subject, I may be allowed to remark that no country has given so much and such effectual attention to the subject of the collection and publication of industrial statistics as the United States. The census reports of that country are, more than any other official publications with which I am acquainted, a mine of economic facts of the highest value; and I may be pardoned if to this comment I add my own hearty appreciation of the excellent services rendered in the compilation of these reports by one of our distinguished guests on the present occasion, General Walker. Most of the monographs prepared on industrial subjects by the special experts employed on the tenth census give very valuable *data* as to wages, not only at the present period, but over a long series of years, while the information collected for each census as to the total amount paid to a given number of operatives employed during the census year enables an approximate estimate of the different rates of wages earned in each industry to be arrived at. Even the census reports, however, valuable and complete though they be, as far as they go, fail of giving all the *data* necessary to enable the comparative and relative circumstances of the industrial classes to be accurately gauged and appreciated. In order to this appreciation, it is necessary that the cost of living, the hours of labour, and the

* The railway statistics of the United States are thus collected by Mr. H. V. Poor.

political and social status of the worker should be fully before us, and this information is supplied in a comprehensive and admirable form by the periodical reports of the Massachusetts Bureau of Statistics of Labour, which every now and again collects and collates returns of the rates of wages and the prices of staple commodities, &c., in different countries. But the reports of this bureau still leave something to be desired. They are open to the objection, which applies so strongly to our own wage returns in the "Miscellaneous Statistics of the United Kingdom," of lacking an uniform plan, and wanting in both consistency and consecutiveness. For one year we have returns of cotton factories, for another of woollen factories, for a third of female operatives, and for a fourth of males. At one time the subject taken up is the French Canadians, at another industrial partnerships, at a third industrial arbitration, and so on. Now, it is certainly not desirable that information intended for general use should be too much stereotyped, and no one can be less desirous than I am that red-tapeism should be carried farther in our official bureaux than it is already. But the progress or regress, comparative and relative, of the industrial classes of a community, or any important section thereof, can only be fairly and satisfactorily measured by comparing precisely the same kind of facts, for the same district, and the same circumstances, as between one period and another; and if this essential relevancy and parallelism is disturbed or interfered with in any way—either by changing the venue, or varying the character of the employment, or interposing some minor differences—the value of the comparison becomes correspondingly vitiated. It is easy to conceive of obstacles being thrown in the way of the collection of wage returns in an old country like this, which would render it difficult, and perhaps impossible, to obtain such information under exactly parallel conditions for two different periods. The employers may find that the publication of such data is calculated to injure them as individuals, and may therefore refuse to comply with any applications that stopped short of being compulsory. Or there may be a great displacement of industry; or trade may be either exceedingly depressed or abnormally inflated for a brief period, causing temporary variations of wages, that would rather tend to mislead than to convey correct ideas as to true rates; or a strike, or a lock-out may be pending; or the introduction of new processes and appliances may have changed not only the character of the remuneration, but even the form of the labour, as in the case of hand looms *v.* power looms, and the puddling furnace *v.* the Bessemer converter. These are all familiar and recurrent phenomena, any one of which would be sufficient, in itself, to lead to erroneous impressions as to the statistical relations of wage-

rates, unless fully and accurately explained and allowed for. The mere mention of these matters will suggest to the statistical experts present many cognate and equally formidable difficulties in the way of securing uniformity in reference to the collection of returns which are liable to be varied by the circumstances of the moment, as many returns unfortunately are.

Again, while speaking of industrial statistics, I would like to suggest whether it might not be possible generally to follow the example of the United States in collecting, either for the ordinary census reports, as is done in that country, or separately, at stated intervals, returns that would show the total capital embarked in each industry, the total amount paid as wages and for raw materials in each district or province for each manufacture, the amount of steam and water power employed, distinguishing the two, and particulars of an allied character. Such returns are calculated to afford a vast amount of valuable information as to the progress of a country in wealth and industry, while they also supply a means of estimating approximately the variations of wages as between one industry and another, and as between two different periods.* The same remark applies to the returns of the gross value of the products of each industry which are collected for the United States census.

One of the most obviously defective of all the various branches of current information to which the numerical method might most advantageously be applied on a uniform plan, is that of the collection and collation of returns relating to the remuneration of labour relatively to the cost of living in different countries. It is true that the matter is complicated by and bound up with considerations as to the economic effects likely to result from a publication of wage returns; and employers, as a rule, have rather set their faces against any attempts to collect rates of wages for purposes of comparison with districts or countries other than their own. Nor is this an altogether unintelligible sentiment. From a strictly local point of view, it is to be presumed that employers who have the benefit of cheaper labour, so far as a daily or weekly wage rate is concerned, are not anxious that their rates should be too prominently or too frequently compared with rates that are nominally higher in perhaps the very next county, the tendency in such cases generally being to level up from the lower rather than to level down from the higher standard. There may again be

* The statistics of wages are not specially collected for the United States census, so far as different classes or grades of employment are concerned; but with the total amount paid as wages during any one year in any particular industry, and the total number of men, women, and children respectively who are employed therein, a rough approximation to average rates becomes possible.

mixed and very opposite motives for preferring that rates of wages should not be given. Employers who pay a high rate of wages may feel averse to its being known that they are thus, to appearance, at a disadvantage as compared with their competitors. I say "to appearance," because it is one of the greatest of economic fallacies to suppose that low wages always represent and involve a low cost of production; so much so, indeed, that it would not be difficult to adduce cases where the very reverse rule applies. Then, again, employers who are accustomed to pay a low rate of wages are seldom disposed to let the details of their wage-book be known, both because they desire to retain whatever advantage there may be, or they may suppose there is, in a low rate of wages, and because they may have a kind of *amour propre* which would be wounded by a general acquaintance with the inferior comparative circumstances of their *employés*. Until these obstacles are got rid of, if that event should ever come to pass, I am afraid that our European wage returns will continue to leave much to be desired.

There is no public department in respect of the working and results of which England compares so unfavourably with other countries as that of agriculture. Our agricultural returns are mainly limited to two annual reports, the first being the "Agri-"cultural Returns of Great Britain, with abstract returns for the "United Kingdom, British Possessions, and Foreign Countries," and the second being the "Annual Report of the Agricultural Depart-"ment of the Privy Council Office." The first report, as its title imports, gives statistics of the average area under each kind of crop, and estimates of this extent for each county and for the country as a whole, together with the numbers of live stock and the prices and imports of corn, &c.; while the second gives returns bearing upon the subject of cattle diseases, &c. It is but a simple act of justice to acknowledge how very largely and admirably the *data* so communicated are supplemented by the records of the Royal Agricultural Society of England, and similar bodies, which undertake, from time to time, agricultural and cognate investigations of great importance. But, to pass from commendation to criticism, I would observe that the United States appear to have a much better and more useful method than our own. Attached to the agricultural department of that country is a Commissioner of Agriculture, whose duty it is "to acquire and preserve in his office all information he "can obtain concerning agriculture by means of books and corres-"pondence, and by practical and scientific experiments, the "collection of statistics and other appropriate means; to collect "new and valuable seeds and plants, to learn by actual cultivation "such of them as may require such tests; to propagate such as

"may be worthy of propagation, and to distribute them among "agriculturists." Then comes the Statistician of the department, whose business it is to collect reliable information as to the condition, prospects, and results of the cereal, cotton, and other crops, by the instrumentality of four correspondents in each county of every State, which information is gathered at stated periods of each month, and "carefully studied, estimated, tabulated, and "published." The statistical department has a staff of thirty-six, and its work is divided under the four following heads:—

1. Crop statistics.
2. Transportation rates.
3. Investigation and correspondence; and
4. Animal industries.

All of these matters are manifestly of very great statistical importance, but the second and third, at all events, are far from being as fully looked after as they should be, and both are almost entirely neglected in our own country—so much so, that no agriculturist who is not a specialist on the subject can tell, or has the means of correctly ascertaining how his rates compare with those of another district sending produce to the same market.

In France, as in the United States, great attention is paid to the collection and publication of agricultural returns. Until November, 1881, when a minister of agriculture was appointed, the duties connected with this branch of administration were taken alternately by the Ministers of the Interior, of Commerce, and of Public Works. Agricultural education is specially provided for by the National Agronomic Institute, national and practical schools of agriculture, school farms, cattle and sheep breeding establishments, the School of Gardening at Versailles, agricultural colonies, nomadic lectures, agronomic stations, &c. A special bureau is charged with the collection of the statistics of harvests, particularly production and consumption, trade in cereals and other produce of the soil, harvests, and corn trade abroad, imports and exports of corn, &c. The reports issued from this office are characterised by fulness, but they differ in certain important particulars from the statistical returns of either our own country or the United States. The first consideration that occurs to one that examines and compares the agricultural statistics of different countries is that England is almost the only country that has not at least attempted to tabulate returns of the quantity and value of the several crops. The acreage under each description of crop, and the percentage of the whole acreage under each crop has been fully and accurately set forth, but why should not an attempt be made, as in nearly every other European country, and in our

own colonies, to state the actual produce, and its approximate value from year to year?* Nor are the returns of the acreage under cultivation so complete as they might be. The number of special descriptions of agricultural produce separately distinguished is fewer in the English official returns than in those of most other countries, and of the production of cheese, butter, and other dairy produce, no returns whatever are available. Again, there are in Great Britain 190,710 acres of orchards, 53,065 acres of market gardens, and 12,466 acres of nursery grounds, while about 2½ millions are returned as "woods;" but no attempt is made to distinguish between the different varieties of fruits, vegetables, &c., grown on these several areas.

But I venture to express the opinion that when we have specifically ascertained the average of each description of crop under cultivation, and the average produce per acre, we have not done all that might with advantage be done in the way of collecting and publishing agricultural returns, and I even doubt whether these details, important though they undoubtedly are, may not be subordinate in importance to others that are now entirely neglected. Of how much greater economic value would it be if we could obtain, with respect to whole counties, if not in reference to the country generally, returns of the approximate cost of producing specific crops, as based upon the average rentals, the expenditure incurred for manures, the number and character of the implements employed, the number of "hands" and horses required for the cultivation of a given description of crop, and the *maxima* and the *minima* of work performed under as nearly as possible parallel conditions. Much of this information is officially published in the United States; and there would seem to be no insuperable obstacle in the way of obtaining it for this country also. Could so much be achieved, our agricultural population would be afforded the golden opportunity, now denied to them, of comparing their circumstances with those of other countries, to whom, of course, the same kind of advantages would accrue.

Another defect in our agricultural returns, as in most other statistical documents of the same description, is the want of uniformity in the periods compared. In the English agricultural returns for 1883, for example, the statistics of the crops produced in different countries are in some cases brought up to no later date than 1875-76—*i.e.*, there is an interval of eight years between the publication of the returns and the year to which they apply.†

* Some attempt has been made in this direction only last year, on the lines suggested by Major Craigie in his paper read before the Society in 1883 on "Statistics of Agricultural Production."

† *Vide* p. 110 of Agricultural Returns of Great Britain for 1883.

I am fully aware that some continental countries are not so expert as others getting out their agricultural statistics; but I know of none to which the reproach can be applied that they are so Rip-van-Winkle-like as this; and if information as to agricultural affairs abroad is to be of any value at all, its value must surely be greatly enhanced by being well up to date. Such a criticism applies equally, as this meeting will be fully aware, to other branches of statistical information, and hence is suggested the remark that it might be well for the State to order, as is done in the case of our own mineral returns, that the desired *data* shall in all cases, under suitable penalties, be given in by a specific and sufficiently early date.

The comparatively limited extent of the statistical information with respect to English agriculture collected and published by the State, may be traced to the much more limited provision made in this country than in foreign countries for meeting the charges necessary to this end. Of all countries in the world, France derives the most benefit from State aid to agriculture. The total annual expenditure incurred by the French Government for agricultural purposes is close on two millions sterling (exactly 48 millions of francs), of which, however, only 60 million francs are expended in the collection of statistics. The agricultural department of Great Britain is under the control of the Privy Council, the total annual expenditure of which (excluding superannuation allowances) is from 30,000*l.* to 35,000*l.* a year, and such part of this amount as is bestowed on purely agricultural matters is mainly absorbed in the veterinary department, the chief business of which is to regulate the movement of cattle, with respect to disease, &c. Germany, although very much behind France, is still far ahead of England in reference to the State expenditure undertaken for agricultural purposes, the amount so spent in the year 1883-84 being close on half-a-million pounds sterling, while Austria expends about double that amount annually (in 1883 exactly 976,612*l.*) for the same account. In Italy commerce and agriculture are under one ministry, the annual expenditure of which is so stated as to render it difficult to separate that incurred for each *per se*. But as agriculture is the staple, and commerce but a comparatively minor department, it is safe to conclude that by far the greater part of the annual outlay of 400,000*l.* is incurred on behalf of the former. Even the comparatively small State of Denmark applies a sum of 30,000*l.* a year to agricultural purposes, while Sweden devoted 258,640*l.* in 1883 to allowances and subsidies for the agricultural department; and the little kingdom of Belgium, in the budget for 1844, provided 48,877*l.* for promoting agricultural interests.

Again, I would observe that even in so apparently simple a matter as the expression of agricultural returns, there is a striking absence of uniformity. Why should it be the practice, as it is, to state the produce of one country in cwts., of another in quarters, and of a third in bushels to the acre? This complexity is liable to lead to errors, or at any rate to confusion, in collecting such returns—all the more so when it is remembered that the bushel varies considerably for different descriptions of cereals: the bushel of wheat corresponding to 60 lbs., the bushel of barley to 50 lbs., and the bushel of oats to 40 lbs. A foreigner, or a stranger to the mysteries of our English system of weights and measures, would be very liable, unless more than usually wary, to fall into the trap of making his calculations upon the system of allowing 4 quarters to the cwt., and as there are 8 bushels of wheat to the quarter, he would be almost certain to be mystified, if not misled, by the discovery that instead of 8 bushels × 4 qrs. = 1 cwt of 112 lbs., there are 60 lbs. in a bushel of wheat, and therefore something less than 2 bushels in an imperial quarter of 112 lbs. Much confusion would be avoided if all grain were sold by weight, and so expressed.

It was not until 1874 that the first number of the statistical abstract relating to the principal countries of Europe, and to the United States of America, was published. Up to that time whatever statistical *data* was wanted for the purpose of the politician or the social and economical observer in reference to other countries than our own, had to be sought for in the records of those countries, or in very partial and often incomplete abstracts of them quoted in English statistical works. In his introduction to one of the earlier numbers, Mr. Valpy pointed out in the following terms the difficulties that then, as now, attended the work undertaken by the statistician who desires to institute a comparison of one country with another:—

"Unfortunately the statistics of many countries cannot now be "compared, owing to difference in dates and in the classification "of details; but the making known the want of greater assimi-"lation in the statistical tables of different countries is a necessary "step towards obtaining so important an element in comparative "statistics.

"The first table of this abstract, in which the total area and "total population are stated, affords an instance of the variation "in the dates of some branches of national statistics. It will "be observed that the census of the population is generally taken "decennially, but not in the same year in all countries.

"The tables of the total revenue and expenditure exhibit the "variations that exist in the modes of rendering the financial

"accounts of the various countries. Budget statements or esti-
"mated receipts and expenditure are given by some countries, and
"the actual amounts paid into and out of the public treasury in
"others. There is not a uniformity of practice in giving the gross
"or net amounts of the public income and expenditure. The cost
"of collecting the revenue is treated as a branch of expenditure in
"most countries, and the gross income and expenditure is then
"given; but there are exceptions to this system, and then only net
"accounts are published.

"In statements of the total revenue raised and expenditure
"incurred in each country the amounts received and disbursed
"both by the State and local or departmental authorities ought to
"be included. Both aggregate and separate totals of the results
"of the State and local finances ought to be given in national
"statistics. But the services undertaken by the State and local
"authorities are so differently apportioned in various countries,
"that in this respect considerable difficulties occur in international
"comparisons of revenue and expenditure.

"The construction of railways has caused differences to occur
"not only in the sources of revenue and expenditure, but in the
"amount of the public debt of different countries. Where the
"State undertakes wholly or partially to provide capital for rail-
"way purposes, receipts and payments connected with such ser-
"vices appear in the public accounts, and must be taken into con-
"sideration in making international comparisons of financial
"statistics.

"In the shipping and trade statistics fewer differences have to
"be noticed. As regards returns of imports and exports, although
"most countries distinguish the general and special commerce
"(the latter term means generally 'Imports for Home Consump-
"tion,' and 'Exports of Domestic Produce,' including 'Duty-paid
"'Foreign Imports'), yet it appears that there is not in all
"countries exactly the same classification for goods, nor quite the
"same distinction for the separate kinds of trade."

The statist is the most ordinary of mortals in this respect, that he cannot make bricks without straw. The State that expects to be well up to the mark in reference to the quality and variety of its statistical *data*, must not fail to provide adequately the means necessary to that end, and before passing from this point, I may be excused, in an assembly like this, from expressing the view that of all the money expended by a nation for national purposes, none is so immediately valuable, and so permanently useful and reproductive, as that devoted to the compilation of facts bearing upon the social and economical life of the nation. These will

endure and tell their tale when the much more costly and evanescent schemes of dynasties and governments have faded away into the limbo of oblivion.

Referring now more particularly to the statistical returns of our own country, I should fail in a simple act of justice if I omitted to recognise that England has always been well to the front in respect of the quality and variety of the statistics which she possessed illustrative of her condition and well-being—so much so, indeed, that in the introduction to the first volume of the *Journal* of this Society, it is stated as probable that "no other "country is so well able to trace in detail the progress of its "prosperity during the last century and a half, since the date of the "Reformation." The first volume of our *Journal* is in itself a monument to the zeal with which the study of statistics was pursued among us more than half a century ago, abounding as it does in the statistical results of different important investigations, both public and private. In 1832, Lord Auckland and Mr. Poulet Thomson, who then presided over the Board of Trade, established in connection with that department, an office designed to "collect, "arrange, and publish statements relating to the condition and "bearing upon the various interests of the British empire." The subject of statistical research received a further and very considerable impulse from the formation of the statistical section of the British Association, in 1833, of the Manchester Statistical Society in the same year, and of our own Society, in 1834. From that time, the value of statistical bureaux has been increasingly recognised, alike in our own and in other countries, and the mass of figures that is now issued periodically from nearly every department suggests the consideration whether we are not in danger of being flooded with returns that are too trivial and unimportant to merit the trouble and cost involved in their compilation. For the statistician should never fail to remember that his labours, however useful in themselves, are not of a character that can be expected to receive any great amount of sympathy and appreciation from the general public. They do not charm the imagination, nor delight the fancy. They can never be expected to compete for popular approval with the work of the poet, the historian, or the romancist. At the best, statistics are but tedious literature, and in order to their receiving the utmost possible amount of consideration, it is above all things necessary that they should be presented in the most striking and compendious form, so that the eye, in searching for general or major results, should not be wearied by wading through large masses of trivialities, that possess but a minimum of interest, and are likely to be sought for, if at all, by the very few only.

Such considerations as those just enunciated would appear to have had some influence in suggesting the appointment in 1877 of a Treasury Committee to consider the question of harmonising the national statistics of the British Empire. That Committee made a report (dated the 23rd December, 1879), which has been published in the *Journal* of the Society in full, and to which, therefore, I need not here make any extended reference. The evidence taken by the Committee, and the Report which they presented to the Treasury, show both the absence of uniformity in the general statistics of the country, and the multiplication of details of minor importance to which I have referred, to the serious detriment of the work undertaken by the bureaux charged with their collection.

One of the most serious defects that now appear in our statistical returns is the absence of uniformity in the periods of their issue. In most countries, and in most statistical documents that are published periodically, the year is made to terminate on the 31st December, and there seems to be no good reason why that date should not be made universal. But instead of this, we find that the financial year of the Treasury terminates on the 31st March; that of the Customs at two different dates; that of the Factory Department of the Home Office on the 31st October, and so with other departments of Governmental administration. This want of co-ordination renders a comparison of different periods extremely and unnecessarily troublesome, and causes the accuracy of such a work to be more or less vitiated, even when every possible care has been taken to render the conditions as strictly relevant and parallel to each other as the circumstances will admit of.

Before passing from the statistics of our own country, permit me to say that, while admitting most fully the great value of the "Statistical Abstract of the Principal Foreign Countries," which has been issued annually since 1874 by the Board of Trade, I consider that its value would be greatly enhanced if, instead of simply giving a table of English equivalents of foreign moneys and measures at the commencement of the volume, steps were taken to have those foreign moneys and weights reduced to their English equivalents, before presenting them to the public. There would not, I should suppose, be any real difficulty about this, and the clerical staff employed by the Board of Trade are so much more accustomed to work of this kind than the ordinary reader, that they might be expected to execute it both more expeditiously and more accurately. The question of exchange need not raise an insuperable obstacle, inasmuch as the rate of exchange can always be ascertained for and applied to the specific periods to which the figures relate. As an example of the irritation, not to say

actual exasperation with which this deficiency must be viewed, I may mention that in Table 36 of a recent number of the "Foreign "Statistical Abstract" there would be eleven different arithmetical sums to work out before an inquirer could ascertain what was the value of the imports and exports of bullion and specie in different European countries. In the same number the principle which I would recommend for application to all the tables alike has been applied to some; as, for example, to the amounts of import duties collected in different countries, which are returned both in the original foreign currency and in the currency of Great Britain; but this, and other rare exceptions, only makes the want of uniformity referred to all the more distracting and inexcusable.

The want of uniformity in our systems of weights and measures, &c., has often engaged the attention of statistical experts, but hitherto, as it would seem, without the desired result. Shall we ever reach that millenium state for which statists have always so fondly hoped, when the nations of the world shall be found adopting uniformity in this direction, and when the monetary differences that now distract the weary wayfarer shall "cease from troubling?" I am afraid that it would be almost as hopeless to expect the realisation of the dream of the poet Burns,

> "When man to man the warld o'er, shall brithers be an' a' that,"

or, to be more specific, that one universal language shall be spoken, or one universal system of dietary adopted. That there would be immense advantage in the general adoption of the metric system almost all statists are agreed. That system is already practically universal in scientific nomenclature and definition; its conveniences and adaptability are obvious, and few statists would not feel grateful for the saving of labour that its general use would bring about. But I, for one, am far from sanguine that this economy of brains will ever be realized, and I fear we shall be content to go on, as we have gone on hitherto, spending many valuable hours that could be and should be better employed, in ringing the changes on kilogrammes and pounds, kilometres and miles, francs and shillings, acres and hectares. And yet there is no necessary reason for such a state of things. The metric system has already been adopted in Germany, France, Belgium, Switzerland, Italy, &c., and if England and Russia would only arrange to follow suit, such other nations as are of any account would almost be compelled to fall in with the general system.

In considering how to secure uniformity of periodically collected statistics, it is desirable to distinguish between returns that are made under State compulsion and those that are voluntary. The former are generally full and reliable; the latter are frequently

necessarily incomplete. For many years the mineral statistics of this country were compiled from voluntary returns. They are now compulsory as regards minerals, but voluntary as regards iron, steel, &c. Unless upon proved necessity, or for a purpose of general public utility, it is seldom deemed to be desirable that Government should compel the disclosure of facts and figures that are more or less of a private character. This is probably not the occasion on which to consider how far Government should proceed in the direction indicated. It occurs to me to mention, however, that while the returns of the production of metals are in this country, and in the United States, collected by voluntary agencies, they are in most continental countries made the subject of State compulsion, and any statist who takes the trouble to examine the returns collected under each of the two different systems is hardly likely, in my opinion, to pronounce very decidedly in favour of either. The State-ordered and State-aided work has generally the advantage in point of commanding confidence and attention, mainly, as already indicated, because of its undoubted claim to greater completeness; but where returns are collected by voluntary agency they are more frequently collected by, or through, special experts, whose thorough acquaintance with the subject may be regarded as a fair equivalent, if not something more, for the greater completeness that ought to mark returns ordered by the State, and no one who has examined the statistical *data* collected from time to time by and for the British Association for the Advancement of Science and other societies akin to our own, can fail to have remarked this characteristic. Under both systems, however, it often happens, and probably always will happen, that there are those who, regarding the work of the statistician as inquisitorial in its character, and "preferring darkness rather than light," would rather incur the penalties attached to non-compliance with State ordinances on this behalf, than furnish facts which they regard as exclusively their own property.

Let me here digress for a moment to observe that the want of sympathy with statistical inquiry to which I just referred is, after all, not so much to be wondered at if we reflect that there is now no subject possessed of the slightest bearing upon the social and economic relations of mankind to which the omnivorous statistician does not devote his attention. It may truly be said that man is the creature of statistics from his cradle to his grave. In every one of the many aspects which he presents in the social kaleidoscope, he is put under the dissection of figures—in his birth, his parentage, his physical characteristics, his educational attainments, his calling, his citizenship, his eating and drinking, his hours of labour and of recreation, his spending and saving, his condition

as a benedict and a bachelor, his health and sickness, his religion and his politics, his rising up and lying down, his going out and coming in, and, finally, in the cause and manner of his exit from this sublunary sphere. We must not be greatly surprised if this persistent dogging of his footsteps, this invasion of the supposed sanctity of his home, this prying into the most secret concerns of his life, this continual analysis and diagnosis of his condition, this ever present microscopy of figures, somewhat indisposes the average citizen from enjoying as much as we could desire the serious and useful work in which we are engaged. But, on the other hand, what would the state of the world be in the entire absence of statistical knowledge? We may vainly try to imagine the blind probing after the truth, the continual liability to serious economic and administrative errors, that must attend the progress or regress of a country whose geographical limits are undefined, whose population is quite unknown, where the proportions of the sexes are unascertained, where nothing is known statistically respecting either trade or commerce, shipping or railways, taxation or revenue, wealth, industry, vital and economic condition, or general social well-being. If we "look on this picture and on that," we shall, I think, be ready to admit that the drawbacks and inconveniences attending "not too many statistics, but just enough," are as nothing in comparison with those that would result from anything short of this attainment.

In his inaugural address to this Society in 1877, Mr. Shaw-Lefevre pointed out how necessary it was that "in making com-"parisons between two periods and two places, the statistics "should be collected and framed upon the same basis, and with "the same care." There is no branch of statistical data that does not call for the exercise of this discrimination. In some, though I venture to hope in very rare cases, there is either a wilful perversion of facts, or a gross want of care in collecting them, which leads to much the same results. But in the majority of cases there is, I venture to believe, a most anxious desire on the part of statistical enumerators to record all the *data* demanded from them with the utmost fidelity to truth; and in such cases the danger to be guarded against is that of the absence of a common appreciation of definitions. Thus, in tabulating the returns of occupations, for census purposes, it often happens that a numerous class are catalogued as following commerce in one census, while in another they are returned as being engaged in industry. In one census policemen and soldiers are included among those following professional pursuits; in another they appear as a distinct class; and, in a third, they are not separately distinguished at all. The difficulties hence arising are so numerous and so serious that a complete

recasting of the census returns is necessary in order to obtain any precise knowledge of the differences that distinguish different countries in reference to the numbers employed in different employments or classes of occupations. Upon this branch of my subject, however, I do not propose to enlarge, remembering that a paper is shortly to be laid before you in which, I believe, it will receive full and capable treatment.

It is curious how far modern nations, perhaps often without conscious effort, have become assimilated to the same methods of statistical inquiry and tabulation. There has been a greater tendency towards uniformity within recent years than during any previous period of which we have a record. Statistics are the principal, and to a certain extent, the only landmarks whereby the progress of a country can be accurately measured. This has become so far recognised on the part of all modern nations, that statistical bureaux have been established where they were not dreamt of before, and have acquired enhanced importance where they had long been regarded as a necessary adjunct of imperial or municipal administration. It has now come to this, that a high degree of civilisation, and a high and adequate standard of efficiency in regard to the collection of statistical *data* respecting matter of public concern, may almost be regarded as convertible terms.

Highly important as have been the reforms introduced within recent years into the collection and arithmetical expression of returns of exports and imports, a good deal still remains to be done. It would, for example, avoid much confusion of ideas and needless misapprehension of facts, if the returns of the value of imports were always expressed in the same terms as the returns of exports, that is, with reference to the value only at the port of shipment, and not, as at present, in such a way as to add to that value the cost of ocean freights, &c., which makes the difference in respect of what is commonly spoken of as "the balance of trade" appear to be enormously larger than it really is.

The high testimony of Lord O'Hagan may be appealed to on behalf of the progress made in the collection and numerical exposition of judicial statistics. The motives of crime, its causes and the means of its repression are much the same in all the countries of the world. But there is as yet a great absence of uniformity in regard to the methods of setting forth such *data*, and there is such a variety and complexity of procedure in the administration of civil and criminal justice, that it is doubtful whether we shall see that correlation of facts that would be so valuable in estimating the comparative effects of ethnographical peculiarities, habits of life, temperance, industry, poverty, and

other contributory means, in the criminal records of different countries.

In drawing this paper to a close, it may perhaps be expected that I should venture upon offering some practical suggestions as to the principles and rules upon which statistical *data* should be compiled. This, however, is an extremely onerous, and by no means necessary complement of the duty I have undertaken to discharge, which was rather that of showing how far uniformity of facts and methods was desirable, than the more pretentious task of specifying the precise lines upon which such necessary co-ordination should proceed. The truth is, that it is almost impossible to lay down any rules that would equally apply to all, or even any great range of statistical facts. Statisticians are not even yet agreed upon the proper functions and scope of the materials with which it is their business to deal. Quetelet has described the function of statistics as being that of representing the condition of a State at a given point of time; which, although a much wider definition than that of Achenwall, who spoke of statistics as being only "a collection of "*remarkable* facts concerning a State," is yet far from approaching the breadth and scope of that of Mayr, who has described statistical science as "the systematic statement and "explanation of actual events, and of the laws of man's social "life that may be deduced from these on the basis of the "quantitative observation of aggregates." The last named author further sets forth that "the collective whole of the "operations which make up the evidence of statistical inquiry, "may be divided into the following groups, viz.:—

"1. The aggregate-observation of the social facts."

"2. The grouping and numerical treatment of the original "statistical material obtained by this aggregate-observation."

"3. The further scientific employment of the numerical "materials of statistics, especially with a view to the establish-"ment of the existence of regularities in social life."

This comprehensive, and on the whole correct, definition of the scientific character and function of statistics may, of course, be indefinitely varied, according as their purpose and bearing is general or particular. For one purpose many, and for another few details are necessary. In one case the figures are valuable mainly for their all-round completeness, in another for the general results to which they point and the laws or conclusions thereon founded. In proceeding, therefore, from the abstract to the concrete, from the theoretical principles to the practical use of statistical *data*, it will be found that each class or order will

require to be governed by its own special exigencies, and that to frame specific rules that would satisfy ever-varying concrete conditions would be practically impossible.

It will be gathered from the general tenour of the remarks that have already been made, that the chief *desiderata* required with a view to the improvement and co-ordination of the statistical work undertaken by different Government bureaux are :—

1. An agreement as to the major facts necessary to be collected for each special department of statistics.
2. Uniformity in the processes by which these facts are got together.
3. Co-ordination of the methods whereby the materials thus collected are systematised and made use of.
4. The adoption, as far as possible, of the calendar year as the universal statistical period, so that when comparisons are made they should always relate to the same dates.
5. The general adoption of the metrical system of weights, measures, and currency.

APPENDIX.—*Synopsis of Contents of Statistical Annuals.*

Great Britain.	France.	Prussia.	Austria.	Hungary.	Italy.	Belgium.
1. Revenue and expenditure	Territory, &c.	Territory	Territory	Population	Topography and hydrography	Territory
2. National debt	Population, &c.	Population	Population	Rural economy	Meteorology	Population
3. Customs tariff	Public worship	Working population	Movement of population	Mines	Population	General elections
4. Local taxation	Criminal justice	Societies, &c.	Rural economy	Commerce	Army	Provincial elections
5. Excise	Civil justice	Funded property	Manufactures	Railways, &c.	Navy	Communal elections
6. Imports and exports	Prisoners, &c.	Rural economy	Commerce	Fires	Public works	Provincial administration
7. Bullion	Pauperism, insanity, &c.	Factories, salt works, &c.	Railways	Public health	State finances	Crime
8. Transhipments	Benefit societies	Manufactures	Navigation	Justice	Public worship	Primary education
9. Average prices	Public institutions	Public works	Postal communication	Religion	Communal finances	Higher "
10. Shipping	Fine arts	Circulation	Telegraphs	Education	Instruction	Fine arts, &c.
11. Corn prices, &c.	Electoral statistics	Commerce	Church	State administration	Justice	Worship
12. Agricultural statistics	Army recruiting	Credit institutions	Education	—	Prisons, &c.	Medicine
13. Railways	" health, &c.	Chambers of commerce, &c.	Press	—	Charitable institutions, &c.	Charity
14. Mines	Agriculture	Assurances	Justice	—	Navigation	Civil justice
15. Coinage	Horses and studs	Friendly societies, &c.	Finance	—	Commerce	Criminal justice
16. Savings banks	Industry	Education	Banking, &c.	—	Live stock	Civil guards
17. Bank of England	Professions and salaries	Religion	Savings banks	—	Agriculture	Militia
18. Bankers, clearing house	Sea fisheries	Public health	Public health, &c.	—	Banking and minting	Army
19. Post office	Highways, &c.	Arts and sciences	Fire	—	Emigration	Agriculture
20. Population	Commerce and navigation	Justice	Army and Navy	—	Elections, &c.	Industry
21. Army	Octrois	Finance	—	—	—	Commerce
22. Police	Finances and taxes	Army and Navy	—	—	—	Banks
23. Emigration, &c.	Casualties and losses	Legislative bodies &c.	—	—	—	Communications
24. Education	Assurances	Local taxation, &c.	—	—	—	Posts and telegraphs
25. Pauperism	Algeria	—	—	—	—	—
26. Bankruptcy	Colonies and French possessions	—	—	—	—	—
27. Crime	—	—	—	—	—	—
28. Wrecks	—	—	—	—	—	—

Discussion *on* Mr. Jeans's Paper.

Professor Leone Levi said they were greatly indebted to the reader of the paper for bringing the real subject of the conference before them. The reason why the presence of foreign delegates had been invited at the Jubilee Meeting of the Statistical Society of London was to make common cause with them in the labour they had in hand. They were statisticians depending for their materials on the labours of statisticians. The statistics so supplied differed very materially, not only upon the subject matter of inquiry, but upon the accessory facts resulting from the subject, often including matter of great importance. They also differed in the nomenclature used. Unfortunately languages were not always translatable; words had different meanings in different countries. For instance the word "house" might mean a building by itself or the habitation of a family, consisting of one, two, or three rooms, or what was called in Scotland a "flat" in a large building. And if the mere word is used without explanation the reader of statistics of houses may be entirely mistaken as to the meaning of the word. A common nosology of diseases had been constructed by their late distinguished friend Dr. Farr, and it was greatly to be desired that a common nosology or cause of crime, or of the nomenclature of crime, might be given so that the judicial statistics of different countries might be made comparable. The statistics of different countries differed now in the weights, measures, and coins; in the meridian from which observations were made; in the calendar on which the dates were constructed; or in the thermometer by which physical facts were expressed; and he need not say how much labour these differences cause to students of statistical science. The conversion of such data was of course easy, but they necessitated labour and produced a want of perspicacity in the results. The International Statistical Congress had worked for many years in the direction of removing such differences, and had elaborated a vast number of schedules of inquiry upon every possible subject; perhaps they had gone a little too far in the number of subjects they had taken up, and in the details they had required. And so, unfortunately, they had failed to effect what they desired, and this for two reasons: in the first instance because the labours of the statisticians assembled in Paris, or in St. Petersburg, in London, in Vienna, or in Rome, were not sufficiently appreciated by the Governments which gave rise to the Congresses themselves. When the statisticians went home to their countries they found their Governments unwilling to give attention or to carry into effect the recommendations of the Congress. Perhaps they were unable to do so; perhaps they found it impossible to carry into effect all the details as desired; but the fact remained that the recommendations of the International Statistical Congress had not been carried out by the States which

sent deputies to those congresses. Another reason why these congresses had failed was that the public required educating as to the value of statistics. Governments were unable to obtain statistics because the people resented the inquiries as inquisitorial, or grudged the expense involved in their publication. They did not understand the value of statistics, and were afraid of the publication of facts. Let it be clearly understood that statisticians had nothing to do with individual facts or with divulging individual cases; their object was to deduce from general facts certain laws affecting great multitudes of men or phenomena. They must therefore plead at the bar of public opinion that the door might not be shut either to the Government statistician or to the voluntary statistician, under the assurance that the information given upon the various points within their range would be used conscientiously, honestly, and with sole regard to the public welfare, and in order to elicit laws and principles of general action and general welfare without reference whatever to the individual sources from which the facts are gathered. They therefore pleaded for a greater deference for the labours of the statistician, be they official or voluntary, in order that they might go further and further in inquiries of that nature.

Mr. A. E. Bateman said he should not have risen, but that the department with which he had the honour of being connected had been so much referred to by Mr. Jeans in his excellent paper, and he desired to place on record some corrections of his remarks. Mr. Jeans had fallen into a few errors, and he had not introduced some of the weakest points in the Board of Trade and other official statistics. He appeared to want a Utopia—that statistics should be fresh and hot. He objected to the statistical abstracts because the publication only came out once a year, and he wanted the information once a month. Then he was a little unreasonable, because Mr. Jeans also wanted greater detail. Unless persons were taking statistics or having statistics taken of them every day, and the whole day long, they could hardly accomplish all that Mr. Jeans desired. Mr. Jeans had found fault with the omission of religion from the abstracts. That was perhaps rather a matter of opinion. In England there was a great dislike to stating the religion. Many persons, he supposed the majority, regarded religion as a matter between a man and his Maker, and did not think it the province of the State to inquire what religion a man professed. That was one reason why religious statistics were not given in this country. Mr. Jeans thought, however, that the omission was rather compensated for by giving average prices. He could not agree with that statement. He thought that the average prices given for imports of commodities were among the weakest part of the returns. They could not be compared with foreign country prices as a rule, because there was no uniform system of tariffs. The classification of articles for import and export in each country was different. When they had another Utopia—a uniform tariff all over the world, or free trade all over the world—perhaps they would come about the same time—they might get satisfactory

prices deduced from imports and exports. With regard to agricultural returns, Mr. Jeans had remarked that they had not in many cases the foreign statistics later than 1875 or 1876. For that they had to blame their foreign friends, because the department had taken the latest published accounts in foreign countries; they had not in their "superfluity of naughtiness" rejected the returns of 1881-83, and put in those of 1876. It was no doubt a misfortune that in some foreign countries the returns had not been brought quite up to date. Mr. Jeans had also complained that the returns gave the number of bushels and not the weight. That again was a question of trade. The trade would not have grain sold by weight. A Bill had been brought forward on the subject, but it had always been opposed by the great body of traders. He could not help thinking that they ought to assume a certain amount of intelligence in any man who looked at statistics. Such a man should be able to understand that the weight of oats was less than the weight of wheat. It was impossible to make their statistics quite easy for a small child. A person looking at them should have a certain amount of knowledge of the subject dealt with. Mr. Jeans had also found fault with the English equivalents not being in the tables in the foreign abstract. No doubt it would be more convenient in some instances. The original figures were kept chiefly as a check. They were sent to the foreign bureaus and there corrected. He believed that that was almost the only abstract that was regularly sent and corrected at the fountain head. In that way he thought they had more correct information than was given in other abstracts which were compiled at a distance. Mr. Jeans desired that they should exclude the value of the freight and profit from the import returns. He (Mr. Bateman) believed that almost every economist would disagree with him in that respect. The value of imports at a port in England was the value of them at that port, and not the value of them at the other side of the world. If freight were excluded, they ought also to exclude profit and commission if they wished to get the value at the other side of the world. Most economists he believed would agree with him that they were right in giving the value of the goods as they were landed. Having made those few corrections, he begged to thank Mr. Jeans for having called their attention to the subject. They all gained by criticism, and they were much indebted to Mr. Jeans for the trouble he had taken in preparing his excellent paper.

Mr. Stephen Bourne said he wished to allude to the point to which Mr. Bateman had drawn attention, namely, the taking of the value of imports at the port of shipment. His experience led him to believe that it would be utterly impossible to get at the value of the goods at the time they were put on board, and he agreed with Mr. Bateman that a return made in that way would be less valuable than in the form at present adopted. He thought it was a very great error in principle to desire that statistics in official publications should be always reduced to too great an amount of uniformity, that the work of the reader should in all

cases be made so easy that he had no necessity to exercise his skill, or to make any inquiry as to the meaning of what was before him. The compiler of statistics in two different countries might attach different meanings to the same terms, and to the objects which statistics were calculated to effect, and anyone who believed that a uniform principle was always adopted might be very much misled. He quite agreed that the representatives of different nations, and still more of different departments in the one nation, should consult together and see what were the points that were most valuable. In that way by imparting information to one another they might materially improve their records. But then they ought always to consider that statistics to be true ought to be natural, and that they should be guided by natural circumstances to a great extent as to periods and as to their character. Some ports for instance were shut up by ice for certain long times, and it would be desirable that their accounts should be made not for the current year terminating at any particular period but at a time terminating by the season. In the West Indies, where he spent a great part of his early life, it was very convenient that the accounts of sugar, &c., should be made up at the time when the crop was ended. There were various principles of that kind applied to compilations varying in different countries, and what they wanted was to get a period in each that was most convenient, ultimately leaving it to statisticians to digest the returns for the benefit of the public, using their own discretion and judgment in dealing with simple materials. The simpler and the earlier the materials, the more likely they were to be correct.

Mr. Rowland Hamilton said he wished to add a few words on the side of commerce in addition to what had fallen from two gentlemen, who were so well known in their official capacity, in regard to the necessity of adhering to simple methods of valuation for merchandise included in statistics. If they attempted to subdivide too much it would only end in endless complications. He would briefly exemplify this by reference to one point which had been made, the valuation of imports. That was obtained roughly by taking the market value of the import at the port where it was received. To attempt to make this valuation more exact by deducting an allowance for freight or profit would be practically impossible, because the question would immediately arise to a man versed in commerce, "to whom does the profit belong?" If he, for instance, imported a thousand bales of cotton from a place abroad on his own account, the profit (or it might be the loss) was his own, and there was an end of the transaction. But supposing exactly the same transaction in all details, except that the merchandise belonged to the sender abroad, the profit in this case must be further adjusted with him. The item of profit could not be identified as to the locality by any possible investigation which could be made without an intolerable interference with private concerns. The same remark might be made with regard to the item of freight. The charge earned for this service is the subject of definite or separate ownership, and might belong to an

owner residing in any part of the world. It was far better to confine the statistics to those broad simple facts which could be decided by the rough tests of the market which were open to them all. Estimates of such subordinate items as "profit" or "freight" are appropriate subjects for special and separate investigations.

Mr. Grimshaw (Registrar-General for Ireland) said he quite agreed with the author of the paper that uniformity for the purpose of comparison was advisable. He desired especially to refer to one point to which reference had already been made, namely, the difficulty of getting religious statistics. It so happened that he himself collected the statistics of religion of Ireland. It had not been found practicable to do so in England or in Scotland, but in Ireland they found no difficulty whatever. It might have been anticipated that in a place like Ireland, where religious animosities ran very high, and where there were great difficulties in many respects in governing the country, that the greatest possible difficulty would be found in extracting necessary particulars. At the last census in Ireland Mr. Forster brought the matter to a very decided test indeed, for instead of asking the people to give their religion as a matter of right, just as they might be asked their ages, &c., the Act of Parliament stated that they need not tell their religion unless they pleased. The result was that only a few hundred people in Ireland took advantage of that privilege and declined to tell their religion. Nearly everybody's religion was stated, so much so that the column which was directed by the Act of Parliament to provide in the returns for those who declined to give information concerning their religion, was empty for many places. There were very few persons indeed who objected to state the denomination to which they belonged. He believed that the notion that people were unwilling to tell their religion was rather a bugbear than otherwise. If they were thoroughly assured that their individual peculiarities would not be disclosed, so that they could in any way be identified, no difficulty would be experienced in getting the information. That was the result of his experience in Ireland. It might be thought also that great difficulty would be found in collecting agricultural statistics, but practically there was no difficulty whatever. The land agitations that had swept over the country during the last few years, and caused such great inconvenience to the Government and to almost everybody else, might be thought to have interfered seriously with the collection of agricultural statistics. There were, however, only one or two spots in Ireland where there was any difficulty. The people disclosed these particulars without any difficulty, and curiously enough they disclosed them without any objection to the police. Last year there were, as well as he recollected, only six instances in all Ireland in which the farmers declined to inform the police with regard to the particulars required; and in those cases the objection was rather to the police than to the giving of information. They communicated directly with his office, and the statistics were incorporated without any trouble. The people had as little

suspicion of statistical officers as they had of the General Post Office. He had himself never found any difficulty in the matter, and it was with regard to that point that he desired particularly to speak. It so happened that his office differed somewhat from the corresponding departments in England, for he collected agricultural statistics, emigration statistics, vital statistics, and also dealt (personally) with judicial statistics, so that to a certain extent he did the work that was done by some of his foreign brethren as a general statistician for the country. Of course there were many things which he did not touch, which were dealt with by the Board of Trade through its agents in Ireland. He thought it would be found that the difficulties referred to by the author in obtaining information were not so great as they were supposed to be when they were really confronted. He wished also to say a word or two with regard to the question of weights and measures. In former times various weights and measures were used in Ireland for agricultural produce, and are to some extent used still. Conversion into standard weights for statistical purposes was accomplished with very little difficulty, and now no one ever dreamed of raising the question. The difficulty was one which might be got over in a short time, and people would soon get accustomed to it. It might be dealt with by adopting both methods for a short time, and gradually dropping that which appeared to be the least useful. The difficulties had been got over in that matter also. He believed that uniformity of statistics generally was more easily attained than many of them thought at first sight. If their facts were the same, in compiling them they might reach a certain stage at which they might be only useful for local purposes, or for the purposes of each individual State; but he thought there was a stage at which they might become universally applicable. If different nations could agree to bring everything up to that point, it would be a matter of very great importance; they need not weight themselves with intermediate processes, which were only useful for each individual country or each individual locality. As to the early publication of statistics, many persons outside Government offices did not thoroughly appreciate the difficulty. Such things could not be done rapidly. It took a good deal of time to obtain the information, and a good deal of time to arrange it when it was obtained. Of course returns published weekly, monthly, or quarterly, such as were issued by the various departments, were only approximate, and had to be revised; but they were so closely approximate that for practical purposes they were always reliable. For uniformity purposes he thought that annual abstracts would be found amply sufficient, without looking for further details. As to the termination of the year, there was no doubt a very great difficulty, and one of the prominent points to be considered was the fixing of a date as far as possible. It might result in delay, but it was equally certain that each date fixed would have a delay of its own, and would raise other complications. It would be much better to have a regularly fixed date, which would admit of no very great difficulty in comparing most statistics one with the other.

Mr. Edwin Chadwick, C.B., said that unless complete assurance was given to the farmer as to the object sought, and that it would give no particulars as to their yields to parties interested, no accurate agricultural statistics would be obtained in England. The present statistics were no doubt largely erroneous. The average amount of corn in corn-growing counties was said to be 26 bushels to an acre; but the Mark Lane brokers sent round skilled persons to test the crops for themselves, and their returns gave 32 bushels to an acre. Farmers had all sorts of motives for diminishing the returns, and false valuations were constantly given in order to avoid a proportionate payment of rates. He remembered the case of a Quaker who thought himself bound to tell the truth, and who was called by the farmers a d——d rascal because he sent in accurate returns. The difficulty could only be overcome by assuring the farmer that his return would not be shown to the landlord. Farmers had said to him, when making inquiries in regard to sewage farms, "Do you want this information for yourself? If you do I will give it to you out of personal respect, but I am not going to make any statement of this kind for the information of landlords or tax collectors." It was on that account that he desired to tell their foreign friends not to rely upon agricultural returns for England; or to take them only as minimum returns. Farmers generally held that they were not bound to answer questions which they conceived parties had no right to put to them. The only alternative was to estimate the crops by the view of independent and competent persons.

The President said that previously to almost all the recent censuses in England, the Statistical Society had represented to the Government their great desire, and the desire, as they believed, of the great majority of the public, that information should be collected upon the subject of religious belief. But he was sorry to say that on every occasion with regard to England and Scotland, the Government having sounded the feeling of the House of Commons and ascertained the prospect of obtaining the power of calling upon the people for information, had refused to introduce a column for that subject. He hoped that the discussion of the question would help to remove the objections felt by their representatives, or that in the new House of Commons there would be more enlightened minds, who would understand that information on such subjects was required for general and not for individual and particular purposes, and that before long, perhaps on the next occasion, a religious census would be ordered.

The Rev. John N. Worsfold said he completely sympathised with Mr. Jeans in that part of his paper in which he called attention to the want of statistics with regard to religious profession, and he entirely differed from Mr. Bateman in the criticism which he had passed upon the author's remarks. He was thankful that testimony had been offered in support of his view by Mr. Grimshaw from Ireland, because it might have been supposed that if there was a part of the British Empire in which it would be most difficult to

obtain religious statistics it would be Ireland. Surely if the Irish could manage to get over the difficulty, no difficulty ought to be felt in England or Scotland. He wished to remark upon the numberless schemes now being adopted to avoid the inconvenience arising from a want of reliable and authoritative statistics in matters of religion. At the present moment an organisation connected with one of the prominent nonconformist bodies was making inquiries in indirect ways, voluntary and unofficial, to obtain the very information which was refused on authoritative and legislative grounds. It would commend itself to a body like the Statistical Society, met to promote statistical information on all questions, that that was a question which touched very closely all that was connected with human interests in their highest aspects, and that it should not be left out of the schedule of statistical information. He therefore ventured to hope that it would go forth from that meeting of statistical students and inquirers, that they felt that it was very desirable in the interests of the science they more or less represented, that there should be as soon as possible a willingness on the part of those in authority, and of the public at large, to concede that particular feature of information.

Major Craigie said that one instance of the great divergencies of which they had to complain in regard to agricultural statistics related to the examinations that had been made as to the size of farms. There had been district official inquiries, one by the Census Commissioners in 1871, and the other in 1875, and repeated in 1880 in the usual collections of agricultural statistics. Those two systems were entirely divergent, and taking the country as a whole, or comparing the figures from the census and the agricultural reports respectively for the individual counties, as he had tried to do, they got into the most bewildering confusion he had ever experienced in the case of two classes of statistics purporting to deal with precisely the same subject. The want of correlation between the census returns and the more frequent departmental returns, was a matter which not only in England but in other countries was greatly to be lamented. Surely those great decennial censuses ought to be framed to some extent on, or with some relation to, the method of the annual returns, so that they might every ten years check those returns by a somewhat fuller and more complete, but parallel, series of statistics. In dealing with statements of agricultural produce, he thought it was high time to get rid altogether of the antiquated and almost useless practice of giving measure, and to adopt weight. Whenever weight could be given for any agricultural product it ought to be the only, as it certainly was the best, comparative standard. Farmers were every day selling their produce more and more by weight; and at the present moment not only was grain being sold by weight, but they were taking a lesson from their friends on the other side of the Atlantic, and beginning at last, he hoped, to sell stock by weight also. An important letter on this subject appeared in the *Times* of that morning, calling attention to the necessity of pressing upon the

market authorities of the country that in every large market there should be proper weigh-bridges erected, in order that stock might be sold by live weight, so that there might thus be a proper comparison of prices, which could not be obtained in our present market reports respecting the value of animals per head, since they did not know what an "animal" meant. He hoped that the question of making agricultural produce returns in all countries, certainly as far as grain was concerned, in weight, and of promoting the use of weight as a comparative standard in regard to other matters, would not be overlooked in any general question of uniformity.

On the Unification *of* Census Record Tables.

By Joseph Körösi, *Director of Local Statistical Bureau, Buda-Pest: Delegate from the City of Buda-Pest.*

The principal aim of the Statistical Congresses was to secure uniformity of statistical statement in all civilised countries. Among these statements, those which refer to the results of the great censuses are those that attracted the attention of the Congresses in a special manner: six out of the nine Congress meetings treated repeatedly this fundamental question, and the debates and treatises on it form of themselves a little library.

But after all these efforts, after the concurrence of men of letters from all parts of the globe, and even after the support given by the Governments, can one assert that the works published in the different States on the census results are comparable one with another?

In order to answer this question in a trustworthy manner, I undertook in the year 1880 the labour of analysing the vast library represented by the census publications of the different States. The labour was difficult, not only in consequence of its vastness, but still more on account of the fact that these publications are not written in an international language: we find there not only works published in French, English, German, or Italian, but also in the Russian, Swedish, Norwegian, Danish, Dutch, Spanish, Hungarian, and Servian languages; so that this inquiry could not be carried out without the help of interpreters. But it seemed to me well worth the trouble, to illustrate the influence of the long efforts of statistical congresses on the comparability of census works.

I have published the results of this analysis in a special pamphlet;* it may therefore be sufficient to refer in this place only to the final result, viz., *that the census works of the different countries are comparable one to another only in a very small degree.*

If then, one were to let his judgment be guided through the

* *Körösi,* "Projet d'un recensement du monde:" Paris, 1851, Guillaumin. This treatise consists of the following parts: critical review of the resolutions of the Congress; synoptical view upon the questions inquired into by the censuses or the different European States and the United States of America; an analytical extract of the contents of record tables published in the census works of the forenamed States; and finally, propositions to arrive at uniform dealing with contents of published record-tables (*dépouillement*) and uniform manner of publishing the census observations (*cadre international*).

general impression conveyed by the practical results of the congress work, one might imagine that all these efforts had been made in vain. But the above judgment would not be entirely just, either towards Governments, whose good will would be thus wrongly attacked, or towards Congresses, whose resolutions would be thus considered as wanting in practical value. But on the contrary, while we must acknowledge on the one side that the resolutions of the Congresses contain a quantity of wise and necessary instructions, on the other side we can prove, even in a statistical manner, the great zeal shown by the Governments in favour of realising the votes of the congresses. If notwithstanding that, the census works are still non-comparable one with another, the cause of it lies in the fact that the Congresses only took the first step for unifying census statistics, but that they omitted, no matter whether intentionally or under the pressure of a fatal mischance, to make also the very inevitable second step.

The Congresses only occupied themselves with the task how to obtain uniformity in the method of proceedings and the primary formularies, those of inquiry; these formularies were reduced to uniformity in the minutest manner. But they neglected *in toto to form a uniform base to be followed in the publication of the facts, that is, in the record tables.* The Congresses treated most minutely how to unify the dozen of questions which were to be addressed to the people, but did not occupy themselves in the smallest degree with the unification of the millions of answers to these questions that would have to be received. Now as these very answers are precisely what we intend to compare, that is, their summaries (as the French say, their *dépouillement*) or their tables of record, it is clear that it was impossible to arrive at an international comparability as long as each Government drew up and published their tables in a different manner.

I quote here some examples to elucidate the actual state of the case.

At Brussels, for instance, the Congress decided to question every individual as regards age; and immediately we saw how everywhere the Governments hastened to give room to this question in their respective formulas: not a single country opposed it. But as the Congresses provided no resolution to secure the uniformity of the summary tables also, we see how, in this respect, great divergencies develop themselves. Thus many States publish the dates relating to the ages of population by annual periods of age, and this manner of publication—by furnishing the very elements of the age statistics—renders it possible to form all imaginable combinations of ages. But, on the other side, *England* proceeds by quinquennial periods of age (from 0—5 years, 5—10 years, &c.);

Ireland adopts the same periods, but specifies separately the children of the first year; *Scotland* proceeds also by quinquennial periods, but specifies the first 15 years by annual degrees.

The United States of America (1870) specify the first five years of life by annual periods, but next they let two quinquennial classes follow, embracing the age from 5—10 years, and from 10—15 years, and proceed afterwards in the following periods: 15—18 years, 18—20 years, 20—21 years, 21—25 years; when over 25 years they proceed by quinquennial periods, and upwards of 80 years by annual degrees.

Finland publishes the ages by quinquennial classes, specifying the first class in this manner: 0—1 year, 1—3 years, 3—5 years.

Belgium proceeds in the tables of the last Census (1880) like Ireland; but at the Census of 1866 we find no other specification than—born before 1811—born between 1811 and 1851—born later.

Bulgaria publishes quinquennial periods from 0—20 years; then decennial periods from 20—60 years.

British India (1871-72) specifies only the ages under and above 12 years.

All these divergencies would have been avoided if, in addition to the resolution *to inquire* ages, the Congress had accepted also a resolution *how to publish* age statistics, as, for instance, by accepting the simple resolution that the record table of ages ought to be specified by annual degrees.

But besides the above mentioned divergencies, we can also state the following ones: 1. The majority of the States specify the age till the hundredth year, uniting all the people over this age in one category; but Sweden stops this classification at the ninetieth year, Bulgaria at the sixtieth year, &c., so that the census work of such countries does not allow us to deal with the interesting question regarding the statistics of centenarians. 2. A part of the States specify also the number of persons whose age is unknown, whilst others neglect them. 3. There are States which note the age by the *year of birth*, whilst others note the number of *years of life* commenced or finished.

If we pass to the question relating to civil condition (conjugal state)—a question accepted also by all the Governments without exception—we might think that the publication of the respective answers could offer no divergence, these being meant to apply only the simple classification between unmarried, married, widows, and divorced. But notwithstanding that, there is no possibility of comparing all the States of Europe as to the civil condition. For Great Britain, France, and Italy leave out the divorced, whilst Belgium joins these to the widows, so that these States do not

present more than three categories; but the Netherlands present five, joining to the four forenamed categories also one for persons separated from bed and board; and the Swiss publications specify still one category more, viz., for the husbands who were not entered in the census returns as occupying one and the same domicile as their wives. Besides this, it is also uncertain how the persons of whom the civil condition is unknown are classified in the different countries.

But the divergencies of the record tables increase in a geometrical proportion if we pass from the single facts to the compound ones. If we seek, for instance, to know the number of illiterates standing at the schoolable age (say from 6—14 years) we should have to combat not only with the divergencies existing in the publication of age statistics—divergencies which by themselves would prevent us knowing the number of children of these ages for all European countries—but we should still more have to combat also with the obstacles which present themselves in the publication of the statistics of illiteracy. Or if we were to investigate the number of separated women of the period of fertility (16—47 years), we should, it is true, find for a series of countries the number of separated women, but without any indication of their age; and on the other hand, it is true, a series of States specifying the desired ages, but without any indication of the conjugal state, so that such researches could not be brought to a satisfactory conclusion.

It will not be necessary to continue examples, though it would be interesting, at least to show how absolutely void the comparability is, especially of all those most important facts which have regard to the occupation of the people. But what we have mentioned above proves in the most evident manner that we can never arrive at a comparability of census results if we do not occupy ourselves in preparing the record tables on a common international basis. The Congresses occupying themselves with the question how to unify the heads of census inquiries have accomplished a task which, no doubt, was indispensable, but not sufficient. All they settled in this direction must be regarded as a preparation, but a preparation merely, for the veritable task. Till now they have laboured to lay down the foundations of the international statistical building: let us end by really roofing it in.

The question of unifying the record tables has already presented itself here and there at the Congresses. It was especially at the Congress held here in the very city of London in 1860 that two persons, highly competent in the matters of statistics, presented such resolutions; on the one side it was Mr. Hammack himself, the author of the excellent proposals relating to the census inquiry

formula, who submitted resolutions tending to unify also all the record tables; on the other side it was the late Dr. Farr, one of the glories of the Congresses, who presented a proposition for the purpose of unifying the record tables relating especially to the occupations of the people.*

Certainly one can hardly suppress the sentiment of regret, when one sees that there was always some reason for the Congresses to avoid such resolutions; whether for want of time, or for the cause that they did not want to limit the statistical offices in their individual liberty to publish the census-tables after their own judgment. But individual liberty, that is the want of repressing rules, is in principle the most powerful adversary of all legislation or subordination of all contracts, whether in social or in scientific matters. If you put the principle of individual liberty in the foreground, what are then the international statistical meetings in general good for? Under what title was it then possible that the Congresses dared to regulate and to unify the inquiry formulas of the censuses, and even the methods, according to which the different States ought to proceed on these occasions? And if it was notwithstanding found necessary to regulate in this respect the unlimited liberty of statistical offices, and if the results showed that they all subjected themselves voluntarily to the respective wishes of the Congresses, why should one be frightened if now the question is how to restrict the individual liberty of statistical offices respecting record tables—a liberty just as dangerous to the aims of international statistics? And further, is it not easily seen that by accepting a uniform scheme for the record tables, there would always remain in this respect a greater scope for individual liberty than there actually exists in respect to the inquiry formulas? for it is undeniable that the international resolutions which have regard to this point impose themselves with much more severity and allow much less liberty to the office than would be allowed by an international plan of record tables. Such a plan would, for instance, in every way only represent the minimum of dates to be published, and would therefore still leave an infinity of combinations to the free action of the offices. And finally, we

* It is to be regretted that the proposals of Dr. Farr embrace a quantity of matter which is very foreign to the aim of Censuses; thus he wished that in the census works there should also be tables published relating to the raw material of the industrial occupations, to the technical proceedings, to the sale of merchandise, to the revenue of masters and labourers, to the diseases and accidents of labourers, and other things which have nothing at all to do with the state of the population, that is with its momentary outline. This circumstance makes it comprehensible that the Congress proposed to let all Dr. Farr's proposals relating to the second tables of occupation drop

ought not to forget that the resolutions of a scientific meeting, having no coercive power, are nothing else than the expression of their desires; consequently each statistical office remains free to draw up his tables as it likes.

Guided by such views, I prepared in 1881 an international plan of record tables, and distributed it to different European Governments, and to that of the United States of America. I must consider it as a high distinction that these proposals were favourably received not only by the scientific critics, but also by some of the statistical offices, and that a part of the last named was kind enough to take it into consideration in the preparation of the next coming census, whilst some of them applied it even for the publication of the 1881 census.

In 1882, when an international demographic congress met at Geneva, I did not fail to submit this plan to this international meeting also, which, after the extinction of statistical congresses, formed the most competent tribunal to give judgment on census matters. To prove how minute the exigencies are which would be caused by accepting the proposed international scheme; to show that it wanted only a little goodwill to reach at one bound the most important task of unifying all the record tables of the different nations, at present so very divergent one from another; I added on this occasion a completed copy of the proposed international scheme, making an extract of the last Buda-Pest census work on this basis.* The fact how easily the international scheme might be adopted may be elucidated in the clearest manner if I mention that the international extract of the three volumes of this census work does not represent more than half a sheet. The Congress of Geneva accepting this plan, and resolving to distribute it to the different Governments, thus first gave to these proposals an international sanction.

The London Statistical Society, when intending to celebrate its fiftieth anniversary by a general revision of the congress resolutions, rendered me the honour of inviting me to prepare the propositions relating to the unification of the census record tables. Willingly obeying this flattering appeal, I have the honour to present in the following a scheme of international record tables. This scheme corresponds to the "Cadre international pour le "dépouillement des recensements," which has been already accepted at Geneva.† But I have here added to it some more resolutions relating to the occupation tables.

* "Tableaux internationaux des recensements de 1880-81," Ville de Budapest: Berlin, 1882, Puttkammer und Mühlbrecht.

† Some divergences must nevertheless be mentioned, and that in consequence of the circumstance that, failing the time to distribute the corrections to the

Now the anniversary meeting may favour these proposed resolutions, or may find others preferable: anyhow, the chief thing is to acknowledge in principle the necessity of agreeing on an uniform international scheme, and, further, to settle it as quickly as possible. Only in this manner can the really deplorable condition of incomparability, which the different census works actually show, be brought to an end.

Let us also remember, that in a short time in all the civilized countries of the world we shall have again to prepare the censuses of 1890; that in a short time we shall see the great census army, composed of *a million* statistical champions, mobilized again, and we shall again see how—obeying the command of international meetings—these battalions of census officers will overflood each country, each village, each house, to take the description of each building, each family, and each individual! Let us therefore prepare for this rare and important moment, and agree in any practicable resolution to secure the comparability of the millions of statistical facts which will be received. In doing so we shall arrive at one bound at possessing, instead of divergent descriptions of different nations, an uniform description of all mankind!

And chiefly for this present meeting it seems to be the special duty to acknowledge and to honour by such a resolution the memory of Messrs. Farr and Hammack, who—on the soil of this very city of London—made, a quarter of a century ago, the first efforts to arrive at that high degree of international comparability which we are endeavouring to reach at present, and which is doubtless the highest aim to be obtained by statistical co-operation.

International Scheme for Census Record Tables.

A. Dates relating to the amount of population in the different places.
B. Dates relating to houses and lodgings.
C. „ population.
D. „ occupation of the people.

A. Places.

Number of places containing at least 500 inhabitants—501 to 1,000; 1,001 to 2,000; 2,001 to 5,000; 5,001 to 10,000; 10,001 to 20,000; 20,001 to 50,000; 50,001 to 100,000; 100,001 to 200,000;

authors, the minutes of proceedings were printed without having undergone this revision. Consequently, in the Reports of the Geneva Congress some tables are not exactly defined, and also by a fatal transposition of a part of the composition, a small confusion has slipped into the resolutions.

200,001 to 300,000; 300,001 to 400,000; 400,001 to 500,000; more than 500,000 inhabitants.

B. Houses and Lodgings.

I.—*Rooms in Dwelling Houses.*

Number of rooms with one inhabitant or less; with 1 to 3 inhabitants per room; with 3 to 5; with 5 to 10; with more than 10 inhabitants per room.* Total of rooms.

II.—*Dwelling Houses (Public Institutions included).*

(*a.*) Number of the houses from 1 to 5 inhabitants; from 6 to 10; 11 to 20; 21 to 50; 51 to 100; 101 to 200; 201 to 300; and more than 300 inhabitants. Total of the inhabited houses. Number of the inhabited houses.

(*b.*) Number of the houses containing 1 to 5 rooms; 6 to 10; 11 to 15; 16 to 20; 21 to 30; 31 to 40; 41 to 50; 51 to 75; 76 to 100; 101 to 125; 126 to 150; more than 150 rooms. Total of houses.

(*c.*) Number of the ground floor houses; of the 1-storied houses; of the 2-storied houses; of the 3-storied houses; of the 4-storied houses; of the 5-storied houses; of houses with more than 5-stories. Total.

C. Population.†

(*The quotations closed in brackets thus* [ ] *are regarded only as desirable and not as indispensable.*)

I. *Age.*

Table 1.—(*a.*) By annual periods till the hundredth year of age; after this a line for the persons upwards of 100 years, and another for the persons of unknown age. (*b.*) Absolute ciphers of males, females, both sexes. (*c.*) Per cent. ciphers of males, females, both sexes.

[Specification of the first year by months; of the second by quarters; distinction of sexes.]

II.—*Relation regarding the Head of the Family. Inhabitants of Public Institutions.*

Table 2.—Number of persons who reside: (*a*) alone; (*b*) in families; (*c*) in public institutions; (*d*) total.

Specification of the public institutions: (*e*) Number of hotels, public houses, &c., and of their inhabitants; (*f*) idem respecting

* If a lodging contains several rooms, the number of inhabitants of the lodging is to be divided by the number of rooms.

† We mark with *a, b, c,* the principal divisions of the heads of the tables.

infirmaries and hospitals; (*g*) idem respecting institutions for education; (*h*) idem respecting religious institutions; (*i*) idem respecting asylums and charitable institutions; (*k*) idem respecting houses of correction and prisons; (*l*) idem respecting military institutions; (*m*) idem respecting other institutions; (*n*) total.

[*Specification of the persons living in the families:* (*a*) members of the family; (*b*) assistants in industry or commerce; (*c*) hirers; (*d*) servants; (*e*) other persons.]

III.—*Civil State.*

Table 3.—*Civil state by ages:* (*a*) Ages corresponding to the following specification: 0—15 years, 15—20, 20—25, 25—30, 30—35, 35—40, 40—45, 45—50, 50—55, 55—60 years, above 60 years, unknown ages; (*b*) unmarried; males, females, both sexes; (*c*) married (idem); (*d*) widows (idem); (*e*) separated (idem); (*f*) unknown civil state (idem). To add two total sums,

For the purpose of giving an illustration how the tables should be drawn up according to the above plan we let the formula of the third table follow here:—

Table III.—*Civil State by Ages.*

(*a*) Ages.	(*b*) Unmarried.			(*c*) Married.			(*d*) Widows.			(*e*) Separated.			(*f*) Civil State Unknown.		
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
				A. Absolute Ciphers.											
0—15 years.															
15—20 ,,															
20—25 ,,															
25—30 ,,															
30—35 ,,															
35—40 ,,															
40—45 ,,															
45—50 ,,															
50—55 ,,															
55—60 ,,															
Upwards of 60															
Age unknown															
Aggregate number															
Total of men from 20—60															
Total of women from 15—50															
					B. Per cent. ratios										
(as above)															

one for men between 20 and 60, another for women between 15 and 60.

Table 4.—*Husbands who live separated:* males, females, both sexes.

Table 5.—*Difference of age between married couples:* (*a*) Husbands who are younger than their wives by 30 years and more, by 25—30 years, 20—25, 15—20, 10—15, 5—10 years, total; (*b*) Husbands who are of the same age as their wives;* (*c*) Husbands who are older than their wives by 5—10 years, 10—15, 15—20, 20—25, 25—30, more than 30 years, total; (*d*) Cases in which the difference is unknown.

To each column add to the absolute ciphers the percentage calculation.

IV.—*Religious Belief.*

Table 6.—*Specification of all reported religious beliefs.*

Table 7.—*The principal religious beliefs, combined with ages.* The age to be classified in decennial periods till the 60th year; then follows a line for the persons upwards of 60, and one for persons of unknown age; for each of the principal religious beliefs specify the two sexes.

Table 8.—*The principal religious belief combined with civil state:* Absolute and per cent. ciphers of unmarried, married, widows, separated, and of persons of unknown civil state, with distinction of the two sexes.

[Table 9.—*The same with relation to ages.* Specify for each column of the preceding table the following periods of ages: 0—15, 15—20, 20—30, 30—40, 40—50, 50—60, above 60, unknown age.]

V.—*Nationality.*

Table 10.—*Specification of all the nationalities.*

Table 11.—*The principal nationalities specified by age* (see 7th table).

Table 12.—*The principal nationalities combined with civil state* (see 8th table).

[Table 13.—*The same with relation to ages* (see 9th table).]

Table 14.—*The relation between nationality and religious belief.* The first column contains the specification of the principal religious beliefs, the other columns, distinguishing the sexes, the principal nationalities, with distinction of the sexes.

VI.—*Illiteracy.*

Table 15.—*Number of the illiterates:* (*a*) by sexes, males,

* That is, if the difference varies between 0—5 years.

females, both sexes; (*b*) by the principal religious belief; (*c*) by the principal nationalities.

[Table 16.—*Illiteracy by religious beliefs with specifications of ages.* Specify in the first column the ages by quinquennial periods till the 60th year, then over 60, and unknown ages. The other columns to contain the specification of the principal religious belief, with distinction of sexes.]

[Table 17.—*The same for the principal nationalities.*]

VII.—*Infirmities.*

Table 18.—*Infirmities by sexes:* (*a*) blind; (*b*) deaf and dumb; (*c*) idiots; (*d*) insane. Specify under each category the number of persons living in families, or in public institutions. Distinction of sexes.

Table 19.—*Combination of infirmities.* Number of blind who are at the same time deaf and dumb, with distinction of the sexes; number of blind who are at the same time idiots, with distinction of the sexes; number of blind who are at the same time insane, with distinction of the sexes; number of deaf and dumb who are at the same time idiots, with distinction of the sexes; number of deaf and dumb who are at the same time insane, with distinction of the sexes.

Table 20.—*Infirmities combined with the nationality, the religious belief, and the civil state.* Specify for each of the four categories the principal nationalities, the principal religious beliefs, the four categories of civil state. Distinction of sexes.

Table 21.—*Infirmities by age,* specifying it by annual degrees, and distinguishing the sexes.

VIII.—*Birthplaces.*

Table 22.—Born in the same place where registered: born in another place of the county; born in another county (part) of the country; born in another country.* Specify everywhere the sexes, and add per cent. ratios.

IX.—*Legal Domicile* (see Table 22).

X.—*Absent and Present.*

Table 24.—*Specification of places where absent persons reside* (see Table 22, but leaving out the percentage calculations).

Table 25.—*Duration of presence or absence:* (*a*) present since two months at least; since 2—12 months; since more than one year; (*b*) absent (idem). Specify everywhere the sexes.

* The different countries to be specified.

D.—*Occupations.*

For all occupations. Specify the number of masters and labourers, distinguishing the sexes.

For the principal occupations. Specification of ages according to the following periods: 0—15, 15—30, 30—50, 50—60, above 60; two tables, one for the males, the other for the females. Specification of the principal religious beliefs, and of the principal nationalities; two tables, one for the males, the other for the females.

JOSEPH KÖRÖSI.

Buda-Pest, May, 1885.

Mémoire *relativement aux* décisions *des* Congrès internationaux *de* Statistique, *concernant le* questionnaire international *des* recensements. *Par* Joseph Körösi, *Directeur du Bureau de Statistique de la Ville de Buda-Pest, Délégué de la Ville de Buda-Pest.*

Les Congrès internationaux de Statistique s'occupaient à maintes reprises de la question importante des recensements, et surtout de l'uniformisation des questions à poser partout aux recencés.

On a tracé les premiers contours de ce questionnaire dans la première séance de Bruxelles (1853), puis on a élargi et mieux défini les questions à Londres (1860). Le Congrès de Paris (1855) n'ajouta que des questions qui ont rapport à la statistique industrielle (recensement des forces motrices). Plus tard le Congrès de Berlin (1863) s'occupait également du recensement, mais s'occupa plutôt de prende en considération la *qualité de la population* à recenser et le *mode* d'exécution, que le questionnaire même. Le Congrès de Florence (1867) s'occupait surtout d'une partie spéciale du questionnaire, en précisant d'une manière détaillée la rédaction des questions qui se rapportent au mode du séjour (présence et absence). C'était enfin au Congrès de St. Pétersbourg (1873) qu'on soumit toutes les décisions antérieures à une sévère et profonde critique, et tout en réunissant et transformant tout ce qu'on avait décidé à ce sujet auparavant, on formula de nouvelles décisions qui, par conséquent, représentent le dernier mot des Congrès relativement à la question fondamentale du questionnaire international.

Vu la reconnaissance que nous devons aux travaux des Congrès en général, et vu surtout l'extrême exactitude et la circonspection que les rapporteurs du Congrès de St. Pétersbourg, MM. Séménow et Makshéev, avaient appliquées à la révision des resolutions des Congrès précédents : tout le monde adhérera au désir, de ne pas soumettre lesdites resolutions à des changements qu'en tant, que de pareils changements s'imposeraient sous l'aspect d'une nécessité inévitable.

Dirigé par ce sentiment nous nous bornerons autant que possible au rôle du commentateur ; si nous nous permettons de proposer quelques changements, nous les justifierons à chaque pas par l'intention de faire disparaître d'ambiguïtés ou de contradictions qui s'attachent à la rédaction actuelle. Pour la plupart nous ne ferons pas autre chose que de rechercher l'intention qui

présidait à l'origine à l'élaboration des resolutions acceptées, en sorte que nos changements ne visent—pour ainsi dire—que les détails de la rédaction.

La nécessité principale d'une correction se présente dans les trois points *h*, *j*, et *k* du Congrès de St. Pétersbourg. Les questions presentées sous ces points comme indispensables, sont les suivantes:—

(*h.*) La langue parlée.

(*j.*) L'origine, le lieu de naissance, et la nationalité.

(*k.*) La résidence ordinaire et le caractère du séjour au lieu de recensement.

I.

La langue parlée. Faute d'explication on ne saurait dire si l'on entend arriver par cette question à la connaissance de la langue parlée principalement ou à une spécification de toutes les langues qu'on possède.* Or, en étudiant les motifs contenus dans le mémoire de MM. Séménow et Makshéev, il est évident, qu'on ne cherchait pas à connaître le degré de polyglottisme des nations, qu'on ne voulait pas resoudre une question philologique, mais que le fait à éclairer n'était autre chose que la *nationalité éthnographique*, la race. On ne voulait pas constater le nombre d'habitants de l'Angleterre parlant la langue indienne ou la langue latine, mais le nombre des personnes appartenant à la nationalité (race) anglaise, indienne, française, etc. Si les Congrès recommandaient la recherche de la langue parlée, c'était parcequ'ils l'ont prise pour le symptôme le plus caractéristique de la *race.* Mais ajoutons que ce symptôme n'est pas suffisamment défini, vu qu'il y a différence entre la langue maternelle (Muttersprache), la langue parlée en famille (Familiensprache), la langue parlée dans le monde (Umgangsprache), et entre bien d'autres espèces comprises dans l'idée générale d'une "langue parlée." Remarquons encore que toutes ces espèces se prêtent et sont même adoptés comme symptômes caractéristiques pour constater la race.

Pour éviter toute ambiguïté à ce sujet, nous proposons d'exprimer dans la rédaction du point *h* l'intention qui lui présidait dès son origine en disant au lieu de " la langue parlée."

(*h.*) *La nationalité éthnographique* (*race*, *Nationalität*), y ajoutant la remarque, qu'*on recommande pour symptôme caractéristique la langue parlée.*

II.

Après avoir prouvé que le point *h* cherche à constater la nationalité éthnographique, la race, il est clair que le vœu exprimé

* Ainsi p.e. dans le recensement de l'Autriche on a relevé la langue généralement parlée (Umgangsprache) tandis qu'en Belgique toutes les langues du pays, qu'on possède : en Hongrie l'une aussi bien que l'autre.

dans le point *j* de recueillir partout "la nationalité," ne peut s'appliquer qu'à la nationalité politique, savoir à la constatation de l'État (non de la race) auquel on appartient. Et en effet, en nous tournant vers le programme et en parcourant aussi les déliberations de la Section, les doutes qu'on pouvait avoir à cet égard viennent à se dissiper; partout nous trouvons nettement declaré, qu'on ne voulait atteindre autre chose que *le nom de l'État auquel les étrangers appartiennent*, c'est-à-dire, *la nationalité politique des étrangers.** La rédaction différente qui se trouve dans les "Résolutions" manque donc de fondement, et comme cela ne peut pas manquer de confondre, nous proposons de rétablir la rédaction dans sa forme première, c'est-à-dire, *de demander aux nationaux le lieu de leur domicile légal, et aux étrangers le nom de l'État auquel ils appartiennent.*

Nous rencontrons dans le même point *j* une troisième expression encore plus ambiguë que celle de la nationalité, c'est le terme "Origine." Sous cette expression on doit comprendre—

(*a*) ou le pays (lieu) de naissance;
(*b*) ou le lieu dans lequel on a son domicile légal (ce qui donne ainsi pour les étrangers leur nationalité politique). (Staatsangehörigkeit);
(*c*) ou le pays (lieu) de résidence (Wohnort).

Il est évident qu'une expression à ce point peu claire ne peut pas servir de base à des procédés internationaux. Or, comme la première des trois définitions (lieu de naissance) est déjà contenue dans le même point *j;* comme la seconde définition (domicile légal, nationalité politique), conformément à notre proposition ci-mentionné, devra également trouver place dans le même point *j;* comme enfin la troisième définition (résidence ordinaire) est contenue dans le point *k:* le nouveau terme de l' "origine" n'est pas seulement superflu, mais absolument préjudiciable et par conséquent à écarter.

* Tandis que dans les Résolutions des Congrès on ne trouve que le terme "*Nationalité,*" et on ne saurait donc juger au premier aspect si c'est la nationalité éthnographique (la race) ou la nationalité politique (l'indigénat), nous trouvons dans le programme de MM. Séménow et Makshéev cette question unie à la question du domicile légal (voir Programme, page 29) et suivie par la remarque que cette question ne se rapporte qu'aux étrangers, tandis que les nationaux répondreront à la question du lieu de domicile (p. 30). Dans les débats de la première Section du Congrès c'est le proposant, M. Séménow lui même, qui donne l'explication que ce qu'il avait entendu par nationalité, c'est *l'indigénat* (*v.* Travaux, p. 109). Et malgré que la Section ajoute au point *j* la phrase explicative: "*le bulletin indiquera le domicile légal de l'individu,*" nous cherchons en vain dans le rapport fait à l'Assemblée Générale les expressions de domicile légal et (quant aux étrangers) celle de l'indigénat. Au lieu de cela nous n'y rencontrons que l'expression incertaine "*Nationalité*" sans phrase et sans explication. (Nous nous réferons aussi à ce que nous avons dit à cet égard dans notre écrit: "Projet d'un Recensement du Monde." Paris, Guillamin et Cie., 1881.)

Ajoutons encore que cette expression fatale de l'"origine" se présente pour la première fois dans les Resolutions de Londres, mais encore là par nefas. Car nous la rechercherions en vain dans la rédaction authentique desdites Resolutions, c'est-à-dire dans le texte anglais que nous devons aux propositions précises et logiques de M. Hammack: elle ne se glissait parmi les Resolutions que par la traduction française.* L'expression "origine" manque aussi—et cela à bonne raison—dans le mémoire de MM. Séménow et Makshéev, où le point *j* se présente sous la rédaction suivante, absoluement claire:—

(*j*) le lieu de domicile, et pour les étrangers la nationalité.

Aussi ne trouve-t-on pas que la première Section du Congrès de St. Pétersbourg y ait changé quelque chose en dehors de l'adjonction d'une explication du terme de nationalité. Malgré cela nous rencontrons à notre surprise dans le rapport fait à l'Assemblée Générale, à côté du terme déjà ambigu de la "*nationalité*," pour comble aussi l'expression encore plus incertaine de l'"origine." Après tout cela nous nous pourrons absoluement rassurer en retranchant à jamais cette expression nuisible du questionnaire international.

Le point *j* devrait donc recevoir la rédaction suivante:—

(*j*.) *Lieu de naissance.*

Lieu de domicile légal pour les nationaux, et pour les étrangers nom de l'État auquel la personne appartient.†

* Dans son rapport, présenté au Congrès à côté du rapport original anglais le rapporteur français mentionna que la Section eût adopté d'indiquer à côté du lieu de naissance encore le pays d'origine (v. Report of the Fourth International Statistical Congress, p. 152). Bien que ce rapport ne soit pas en concordance parfaite avec les faits, en tant, qu'un membre de la Section a à la vérité exprimé ce vœu, mais sans que la Section l'eût adopté (v. Proceedings, p. 349), nous rencontrons pourtant l'expression de l'"origine" dans la traduction française. Voici le texte anglais des Résolutions et sa traduction française:

(*g*.) Birthplace. Number of foreigners (not naturalised), and statement of the countries to which they respectively belong.

(*g*.) Lieu de naissance (constater ici les étrangers non naturalisés, et leur pays d'origine).

† Pour rendre au lecteur plus facile de porter un jugement sur les intentions premiers du Congrès de St. Pétersbourg à ce sujet et sur notre critique, nous donnons dans ce qui suit un aperçu des variations, que ce point *j* subit dans ses trois phases de développement, soit: Préparation dans le Programme (Mémoire de MM. Séménow et Makshéev),—Discussion dans la Section du Congrès,—Rapport à l'Assemblée Générale sur les résolutions de la Section et Résolutions de cette même Assemblée.

A. *Programme.* On recommande comme question obligatoire:

(*j*.) "*Le lieu de domicile, et pour les étrangers la nationalité* (p. 29).

Sur p. 30 on déclare dans le § 16, que l'on veut constater *par ce point pour les nationaux le lieu de domicile, et pour les étrangers la nationalité.*"

B. *Section.* Dans la séance du 24 août M. Séménow donne l'explication, que "*nationalité*" *signifie* "*indigénat.*" M. Engel y ajoute: "*Chez nous, nous avons*

III.

Le point *k* renferme la question du caractère du séjour au lieu du dénombrement. On ne pourrait affirmer que cette expression soit trop précise, puisque elle nous laisse absolutement dans le doute, sur ce que c'est que le " caractère du séjour ? " (libre ? forcé ? à cause d'affaires ? ou à cause de la santé ? ou officiel ? militaire ? caractère de passage ? etc.).

La question relative au caractère ou au mode du séjour est importante au point de vue de l'espèce de population à dénombrer. Comme la population de fait ne se distingue de la population de droit que par les éléments plus ou moins flottants de la population, le caractère du séjour a agité les Congrès surtout à l'occasion des débats sur l'espèce de la population à recenser. Cette question fut traitée avec le plus vif intérêt aux Congrès de Londres et Florence. On démontra à cette occasion qu'il serait impossible de caractériser d'une manière internationale le mode du séjour, ou la définition de la population flottante, vu que les définitions changent de pays en pays. On accepta donc à Florence avec empressement la proposition de M. Engel, d'ajouter à la question relative au *caractère* du séjour encore une autre, concernant la *durée* du séjour, pour laisser ainsi libre à chaque pays de fixer la durée de l'absence ou de présence qui devrait établir la marque caractéristique pour la population domiciliée ou pour la population flottante. Les résolutions de Florence exigent donc à côté du recueillement du *mode* du séjour encore celui de la *durée ;* mais tandis qu'elles passent brièvement sur l'expression du mode (on ne trouve nulle explication de ce terme ambigu), on insiste sur le terme de la durée, en imposant encore demander pour chaque personne qui n'est pas née dans la commune recensée, la durée de son séjour en jours, semaines, mois,

dit tout bonnement : Nom de l'État auquel la personne appartient." On accepte cette proposition en disant (p. 109) :

" *Nom de l'État auquel le personne appartient, domicile, ou résidence ordinaire,*" et en ajoutant à ce point encore la question relative au caractère du séjour.

Dans la séance du 26 août (p. 113) on propose de rédiger le § 16 ainsi : " *Le bulletin indiquera le domicile légal et la résidence ordinaire de l'individu recensé. Pour les étrangers il indique aussi la nationalité,*" et cette rédaction fut adoptée.

C. *Assemblée Générale* du 28 août. Ici nous retrouvons une rédaction tout-à-fait inattendue du point *j*, qui est présenté et accepté sous la forme suivante :—

(*j.*) " *Origine, lieu de naissance, et nationalite.*"

Et c'est aussi dans les §§ à suivre, que nous devons constater à notre regret des changements inattendus. Ainsi nous trouvons les résolutions du § 16, qui ne se rapportaient qu'au domicile légal, attachées au point 15, traitant la question du lieu de naissance, donc à une chose tout-à-fait différente (§ 15 : L'indication du lieu de naissance ne se rapporte qu'aux personnes nées hors du lieu de recensement ; . . . . pour les étrangers on indique en outre l'État dont ils sont les ressortissants) ; tandis que le nouveau § 16 ne contient qu'une déclaration de laisser les règles pour l'indication de la résidence ordinaire (du séjour habituel, du passage, etc.), à l'appréciation des États respectifs.

ou par ans, et d'adresser les mêmes questions, quant à la durée de leur absence, sur les personnes absentes.

Il est regrettable que les propositions de St. Pétersbourg aient laissé de côté l'amélioration contenue dans l'amendement de M. Engel, et qu'à sa place on ait rétabli le terme incompréhensible de "caractère" du séjour.

Nous proposons de rétablir les resolutions de Florence en rédigeant le point *k* de St. Pétersbourg comme suit :—

(*k.*) *La résidence ordinaire.*

La durée du séjour dans la commune du recensement (par jours, par semaines, par mois, ou par années).

Indiquer de la même façon pour les absents : *la durée de l'absence, et l'endroit du séjour* (lieu et pays).

IV.

Nous aurions ainsi presque épuisé les desiderata principaux en face des resolutions de St. Pétersbourg ; mais étant déjà en train de revision, nous nous permetterons encore d'attirer l'attention sur trois points qui, quoique d'une moindre importance que ceux dont nous venons de parler, méritent pourtant, au point de vue de l'integrité, d'être mentionnés.

Ainsi on pourrait mentionner que les rédactions alternatives, rédigées avec un "ou," laisseraient peut-être en doute, lequel des deux termes que sépare le mot "ou" serait le juste et que par conséquence on devrait eliminer ce mot "ou" autant que possible. Dans ce cas nous dirions :

sous le point (*e*), au lieu de : état civil ou conjugal,

(*e*) *état civil* (*conjugal*) ;

sous le point (*f*), au lieu de : profession ou condition,

(*f*) *profession et condition dans le métier* (patron, ou ouvrier).

Puis, comme la question relative à la connaissance de l'écriture *et* de la lecture pourrait laisser des doutes concernant ce qu'il y aurait à faire des hommes qui ont seulement connaissance de la lecture sans savoir écrire, il contribuerait à la clareté du questionnaire si l'on prend en considération l'intention déclarée, contenue dans le rapport de MM. Séménow et Makshéev, selon laquelle on ne voulait pas établir une catégorie spéciale pour les hommes qui ne savent que lire.* En conséquence de cela on devrait ajouter

* "Il ne faut pas oublier que dans tout enregistrement le critérium est plus ou moins conventionnel. . . Il suffit de connaître seulement le degré de convention du critérium et de fixer en vue des comparaisons un critérium commun pour tous les pays. On pourrait dans le cas présent prende comme critérium le connaissance *même imparfaite* de la lecture et de l'écriture." (Programme, p. 26.)

au questionnaire l'explication que les personnes, qui ne savent que lire, ne sont pas à regarder comme illettrées, ou bien préciser le point *i* tout simplement :—

(i.) *Connaissance de la lecture.*

En nous occupant de la révision des resolutions prises à St. Pétersbourg, nous ne voulions pas supprimer ces remarques de moindre importance (contenus dans le chapitre iv) que nous venons d'indiquer, ne fût ce que dans le but de compléter nos observations. Mais nous ne leur contribuons pas d' importance et n'insistons pas à les soumettre au vœu de la Réunion.

Nous resumons donc nos propositions dans ce que suit :—

Résolutions.

Les résolutions du Congrès International de Statistique de St. Pétersbourg sont maintenues dans toute leur étendue, à l'exception des points *h*, *j*, et *k*, qui sont changé comme suit :

(*h.*) La nationalité éthnographique (race), en recommandent pour symptôme caractéristique la langue parlée.

(*j.*) Le lieu de naissance.

Le lieu de domicile légal pour les nationaux, et pour les étrangers, nom de l'État auquel la personne appartient.

(*k.*) La résidence ordinaire.

La durée du séjour dans la commune du recensement, indiquée par jours, par semaines, par mois, or par années.

Pour les absents : L'endroit du séjour (lieu et pays) et indication de la durée de l'absence, comme ci-dessus.

JOSEPH KÖRÖSI.

BUDA-PEST, *en Mai*, 1885.

Discussion *on* Dr. Körösi's Paper.

General Walker said he was sure that no subject could be brought forward at the Jubilee Meeting of equal importance with that which formed the subject of the paper just read. Uniformity of statistics was, indeed, as Professor Leone Levi had said in the discussion on the previous paper, the real work of the Conference. He was also sure that no one could have brought the subject forward with more authority than the distinguished statistician of Buda-Pest, who, in spite of the difficulties imposed by a half score of foreign languages, and by great diversities in the forms of collecting, compiling, and publishing national and local statistics, had succeeded in constructing that monument of research, "The Statistics of Great Cities." No one could ever come to appreciate more fully the importance of introducing uniformity into the modes of collecting and publishing statistics than Dr. Körösi must have done in carrying out his great work with so much zeal and perseverance. To criticise or discuss the propositions of Dr. Körösi would be to review the discussions of six statistical congresses, for his propositions in the main consisted in the re-presentation of the St. Petersburg resolutions. The very few corrections or modifications of those resolutions which he had offered, appeared to him (General Walker) to be most judicious, and well calculated to advance the real purpose of the St. Petersburg Congress. Dr. Körösi, he thought, had done a very great service to statistical science in calling their attention to the fact that non-comparability of national statistics had resulted, not so much from the failure of the several Governments of Europe and America to include certain definite inquiries in the census schedules, as from the failure to adopt common forms of compilation and publication in the several statistical offices; and he could not help thinking, that if the statisticians in Europe and America in that matter, which was practically within their own control, involving, in most cases, no reference to administrative superiors or to the legislatures of the several countries, would, in the exercise of their discretion, remove those anomalies, and bring the statistics of their several countries as far as possible into conformity and capability of comparison, the few remaining differences and difficulties of that character would be removed by the several Governments to which they might further appeal. The fact that so many and so great differences now existed presented a very important obstacle to the removal of any single difficulty of that kind. On the other hand, if the statisticians of Europe and America would, according to the general scheme of Dr. Körösi, subject of course to criticism and modifications if necessary, bring the publications of their several offices into correspondence and susceptibility of comparison—it might be without legislation, and perhaps, even, in many cases, without

appeal to official superiors—he believed that the slight remaining obstacles to complete uniformity of international statistics would be overcome with comparative ease. Dr. Körösi had alluded in his paper to the classification of ages in the United States in 1870, and very properly lamented the failure of correspondence between the statistics of ages in the United States and those of European countries. Now this was a case precisely in point. The statistics of ages in 1870 in the United States, while they were more full than those of some European countries, were less full than those of others. He had great pleasure in stating, however, that, purely as a matter of administration within the office of the superintendent of the census of 1880, the difficulty complained of had been removed, and the ages of the living population in the United States at the tenth census were published by single years, affording a complete comparison at every point with the corresponding statistics of other countries. In his judgment, and he believed that this was the view of Dr. Körösi, the greater portion of divergencies, discrepancies, and obstacles to the comparison of international statistics now existing could be removed by friendly and often informal correspondence between statisticians in different countries and between the heads of the statistical offices, and he thought that Dr. Körösi had done incalculable service to the cause of international statistics in bringing so strongly and strikingly to their attention this consideration.

The President recommended to the notice of the members Dr. Körösi's brochure, *Tableaux Internationaux des Recensements de* 1880-81, which he said was perhaps the most valuable and complete monument of Dr. Körösi's labours.

Dr. Körösi thanked the members for the kind manner in which they had accepted his proposal, and expressed a hope that they would recommend for general adoption the method he had submitted at the end of his paper.

The President said he thought that any resolutions to be proposed should be brought forward on the following day.

The meeting adjourned at 1.30 p.m. until 3 p.m.

Tuesday, 23rd June. *Second Day.*

AFTERNOON SITTING.

Theatre of the University of London, Burlington Gardens.

Sir Rawson W. Rawson, K.C.M.G., C.B., President, took the Chair at 3 p.m.

On the suggestion of the President,

Mr. Price-Williams explained his coloured diagrams representing the population of the twenty-nine registration districts of London. He said the horizontal lines represented the census decades, and the vertical lines the population in each of the decennial periods from 1801 to 1881. The whole of the twenty-nine registration districts were to the same scale. The rates of increase during each decade were also shown to scale. The diagram of the entire population of London from 1801 to 1881 was drawn to exactly the same scale, both vertically and horizontally, as that of Manchester and Liverpool, which he had shown side by side by way of contrast. It would be noticed that there were in the case of London no signs of that contrary flexure in the outline of the curve of the population which was a very marked feature in the case of Liverpool and Manchester; although, as would be seen from the outline of the ordinates showing the rates of increase, there was a very perceptible decrease in the rate of increase since 1851. The diagram of Kensington might be instanced as showing that the population in that important residential district had nearly attained its maximum; the increase until 1871 had been very rapid, but during the last decade there had been a very great falling off in the rate of increase, and the contrary flexure in the curved outline of the population was, as in the case of Manchester and Liverpool, very marked. In the district of Islington the increase in the population had been very rapid and continuous, and there was no indication at present of any contrary flexure in the curved outline of the population on the diagram. It was in the two large districts of Lewisham and Wandsworth, comprising about 23,000 acres, or more than a fourth of the entire area of the metropolis, that the great increase of the population of London would chiefly occur in the future.

Methods *of* Statistics. *By* F. Y. Edgeworth, M.A., F.S.S.

CONTENTS:

The methods of Statistics are as various as the definitions of the science. The limits of this study have been fixed with reference to the best accredited definitions of Statistics. There are three definitions which seem to deserve attention as respectively the most popular, the most philosophical, and that which is a fair compromise between the conflicting requirements of a good definition. According to the first of these definitions, Statistics is the arithmetical portion of Social Science (dealing not only with figures which fluctuate about a Mean such as death-rates; but also with what may be called solitary returns: such as the number of

men who have been killed in a battle, or the number of cattle who have died of a plague). According to the second definition, Statistics is the science of Means in general (including physical observations); according to the third definition, of those Means which are presented by social phenomena. The third definition is here adopted, but not without occasional reference to the other two, not without the hope that some light may be shed upon our subject by the theory of physical observations, and may be reflected upon the less systematic portions of Social Science.

The term "Means" of course implies the correlative conception: members of a class, or terms of a "Series" (in Mr. Venn's phrase) of which the mean is to be taken: "Massenerscheinungen" in the language of Professor Lexis. The latter rather than the former terminology has been employed by some writers in the enunciation of definitions substantially equivalent to our second and third.

The science of Means comprises two main problems: 1. To find how far the difference between any proposed Means is accidental or indicative of a law? 2. To find what is the best kind of Mean; whether for the purpose contemplated by the first problem, the elimination of chance, or other purposes? An example of the first problem is afforded by some recent experiments in so called "psychical research." One person chooses a suit of cards. Another person makes a guess as to what the choice has been. Many hundred such choices and guesses having been recorded, it has been found that the proportion of successful guesses considerably exceeds the figure which would have been the most probable supposing chance to be the only agency at work, namely $\frac{1}{4}$. *E.g.*, in 1,833 trials the number of successful guesses exceeds 458, the quarter of the total number, by 52. The first problem investigates how far the difference between the average above stated and the results usually obtained in similar experience where pure chance reigns is a significant difference; indicative of the working of a law other than chance, or merely accidental.

As a second example of the first problem the following may be taken: the rate of mortality among young farmers between the ages of 15 and 25, as based upon the observations of 65 deaths in the year, exceeds the rate of mortality in all other professions by 0·3 per cent. How far is such an extent of deviation based upon such a number of observations significant of a real difference in respect of healthiness between the conditions of young farmers and the rest of the industrial community? An example of the second problem is afforded by the inquiry of Jevons: whether in comparing the average prices of two epochs it is better to take the arithmetical or geometrical (or some other kind of) Mean; and (supposing that inquiry answered in favour of a certain class of

Mean, *e.g.*, the weighted Arithmetical Mean), the further inquiry what relative importance shall be attached to the different constituents of the Mean, what *weight* shall be attached to each observation.

The methods of attacking these two problems which will be here considered are those of the more formal kind, those which are afforded by the pure Calculus of Probabilities, as distinguished from Inductive Logic in general. Thus under our first problem we may determine whether there is a real significant difference between the mean statures of men over 30 years of age and under it. But we leave it to the specialist to pronounce whether such a difference is more likely to be due to* real growth after 30, or survival of the tallest. So again under our second problem the questions to be answered in order to determine the best Mean, the subjects of choice, will be construed in a narrow sense. However, it must be remembered that it is difficult to establish a scientific frontier between the doctrine of Chance and Induction.

Ex. 1. The first problem presents two cases: (A) when, as in the examples above given, we compare a single Mean on the one hand with a single mean on the other; and (B) when we compare a set of Means on the one hand with on the other hand either a single Mean or a set of Means. An example of the second case is afforded by Psychical Research: when we have several experiments analogous to the one above described, all or many of them indicating some agency other than chance. The following is another example. There is a slight superiority in the mean stature of men aged 30—33 over that of men aged 27—30 in several American States. How is the evidence afforded by a single comparison heightened by repetition?

A. In the apparatus for eliminating chance the most important piece of mechanism is the *law of error*, or *probability-curve*. In the reasoning founded upon this principle we consider the extent of difference between two Means taken in connection with the number of observations entering into each. For example, in the instance afforded by *Psychical Research* (above p. 182) the premises are a difference of 52 between the Mean obtained in 1,833 trials conducted by M. Richet, and $\frac{1}{4}$ 1,833, the Mean which is known to be obtainable by an indefinitely large number of trials under a *régime* of pure chance. The test here under consideration is not to be confounded with the rough and ready practice of cutting up the compared Means (or rather sums) into parts, and observing whether each part of the one as compared with a corresponding part of the other is in excess (or defect). This operation belongs† to our second case, B.

* See p. 197. † See p. 213.

A full account of the probability-curve will not be expected here.* But it may be well to remind the reader of its principal properties, in order to facilitate the apprehension of its use. The curve may be designated by the equation $y = N\frac{1}{\sqrt{\pi}\,c}\,e^{\frac{-x^2}{c^2}}$; where the abscissa x (*e.g.*, O S in fig. 1 or 2) represents extent of divergence from a certain central point (O) taken as the origin of the curve, and the corresponding ordinate y (S T) represents the number of observations or statistical returns which present just the degree of deviation† represented by x; supposing that the total number of observations or returns is N. Take for example the statures of 8,585 British adult males measured by the Anthropometric Committee of the British Association (Final Report, 1883, Table I). This group of observations fits pretty accurately to the curve $y = 8{,}585\,\frac{1}{\sqrt{\pi}\,3{\cdot}6}\,e^{\frac{-x^2}{13}}$. Thus the largest ordinate according to this representation is $8{,}585 \div \sqrt{\pi}\,3{\cdot}6$ or 1,341. The corresponding figure given by observation is 1,329. As another example take the registrar-general's reports, expressing the proportion of male to female births for the last twenty years in counties where there are about 6,000 births annually. It will be shown below‡ that these figures range on either side of a mean 1,040 under a curve of the form $y = N\frac{1}{\sqrt{\pi}\,c}\,e^{\frac{-x^2}{c^2}}$ where $c = 38$ nearly.

The shape of the curve varies with the value of c, technically termed the *modulus* (O M in figs. 1 and 2). When the modulus is large, the curve is spread out as in fig. 1. When the modulus is

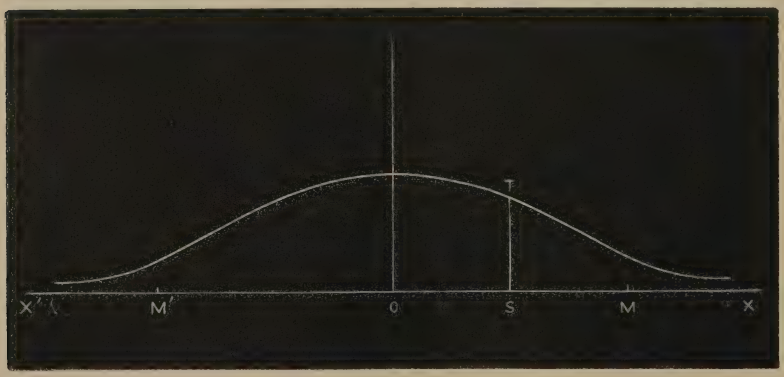


FIG. 1.

* The general reader may be referred to the writings of Quetelet and Galton, and to Jevons's "Principles of Science."

† To make this statement accurately true, the unit employed would have to be supposed indefinitely small. But the maxim *De minimis non curat* is eminently applicable to the science of Probabilities.

‡ See p. 199.

small, the curve is huddled together as in fig. 2.* Whatever the modulus, if we measure from the origin on each side along the

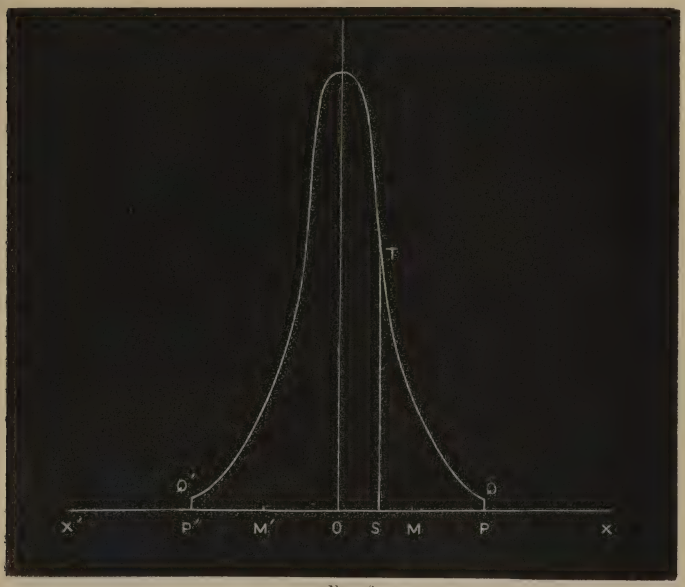


FIG. 2.

line X X′ lengths each equal to twice the modulus (O P and O P′, fig. 2), and erect ordinates (P Q, P′ Q′, fig. 2) at each of the points so determined, by far the greater portion (namely 0·995) of the total area contained between the curve and the horizontal line will be intercepted by those two ordinates. Accordingly, if out of a set of (say) N statistical numbers which fulfil the law of error, we take one at random, it is exceedingly improbable that it will differ from the Mean to the extent of twice, and *à fortiori* thrice, the modulus.

Such is the nature of the *law of error*. Where now is it to be found; under what conditions is it fulfilled? One great sphere of its realization is, as the name implies, errors of observation. It is a fact verified by Airy and others that measurements of a real thing, such as a star's position in the heavens, do approximately group themselves according to this law. There is another kind of real Mean, the deviations from which are obedient to the law; the kind of Mean which enters into most games of chance. Suppose an urn containing an indefinitely large number of black and white tickets mixed up in a certain ratio. And let several sets each consisting of a large number of, say N, tickets be drawn at random from the urn. The several ratios presented by the

* The modulus determines the species of the genus probability-curve; just as the *eccentricity* of an ellipse determines whether the curve is more or less oval.

number of white balls in each set compared with N will range about the real ratio which prevails between the tickets in the urn according to a *law of error;* whose modulus is calculable when the real ratio and the number N are given. In the preceding examples the Means about which the observations are disposed may be called real or "objective." The law is equally fulfilled in the case of what have been called "Subjective" Means: such as *l'homme moyen* of Quetelet.

And not only is this result verified by observation, but it is predictable by theory. There is that consilience between deduction and verification which (as Mill points out) constitutes such high evidence; for analysis* shows that if a quantity depend in any fixed way upon (is any definite function of) a *large set* of elements; each of which elements assumes from time to time a different value according to laws independent of each other; the values assumed by the composite quality from time to time will range under a *law of error.* The following is an easy illustration of this important property. Take at random sums of ten (or more) digits occurring in mathematical or statistical tables. The sums so far used will fluctuate about the Mean 45 according to a law of error (with more or less accuracy according as each sum is made up of more or fewer digits). I have verified this by taking 280 decades. Caution, of course, must be exercised in order that the summed digits may not be connected by a law; as would be the case, *e.g.*, if we summed column-wise the *initial* figures of logarithms in a table.

It follows that the law of error has a sphere of fulfilment in art exceeding even its realisation in nature. Suppose a set of returns not fulfilling the law; for example measurements of stature in the Department of Doubs, which† according to Dr. Bertillon may be represented by fig. 3. Nevertheless take at random a considerable set say 100, or 1,000, men out of that Department; and form the‡ arithmetical mean of their statures. Repeat the operation. The Means so presented do (tend to) range under a probability-curve. Now, as we are chiefly concerned (in

* See "Memoirs of the Astronomical Society," vol. xl, article by Mr. Glaisher, p. 105.

† Article *Moyenne*, "Dictionnaire Encyclopédie Médicale."

‡ This is true also of the Mean which some call Median: that which just bisects the number of observations. It is true also of what may be called Mean Functions, *i.e.*, $\frac{f(x_1)+f(x_2)+\ldots+f(x_n)}{n}$ where x_1, x_2, &c., x_n, are the given observations; *e.g.*, $\frac{x_1^2+x_2^2+\&c.+x_n^2}{n}$. But it is important to notice that the principle is not true, or less true, of the corresponding Means, as distinguished from Mean Functions, *e.g.*, $\sqrt{\frac{x_1^2+x_2^2+\&c.}{n}}$

the solution of our first problem) with numbers of this composite origin, it is submitted that too much importance has been attached to the circumstance that our returns, as they stand and in their unmanipulated form, do* or do not fulfil the law of error. What is required for the elimination of chance is not that the raw material of our observations should fulfil the law of error; but that they should be† constant to any law. It is to be observed that the same principle, that which was described in the preceding paragraph, now supplies us with the law of error ready made, now enables us to generate it artificially. From want of attention to this principle many statisticians have very imperfectly realised both how far the law of error is fulfilled in nature, and how far its fulfilment in nature may be dispensed with by art.

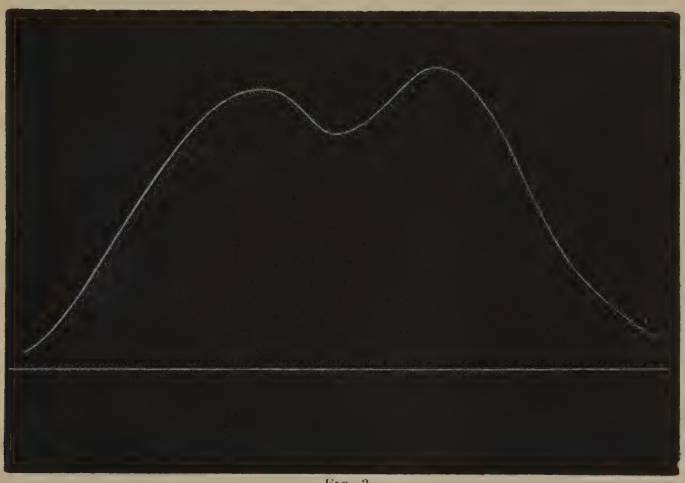


FIG. 3.

These properties lead up to the application of the *law of error.* In order to determine whether the difference between two proposed Means is or is not accidental, form the probability-curve under which the said difference, supposing it were accidental, would range. Consider whether the difference between the observed Means exceeds two or three times the *modulus* of that curve. If it does, the difference is not accidental. For example, in order to determine whether the observed difference between the mean stature of 2,315 criminals ‡ and the mean stature of 8,585 British adult males belonging to the general population is significant, we form the curve according to which the difference

* See note, p. 191.

† Range under any definite facility-curve.

‡ Report of the Anthropometrical Committee (1883), Table VII.

between the mean of a random selection of 2,315 and of 8,585 men fluctuates. And we shall find that the observed difference between the proposed Means, namely about 2 (inches) far exceeds thrice the modulus of that curve, namely 0·2. The difference therefore "comes by cause."

But how are we to form the probability-curve for the difference in question. By this proposition. The modulus for the difference of two quantities is equal to the square root of the sum of the squares of the modulus belonging respectively to each of the two quantities. How then are we to ascertain the modulus, according to which any quantity fulfilling the law of error fluctuates. To this we have reduced our problem: *Hic labor, hoc opus, est.*

Two cases may be distinguished: (1) where the returns with which we have to deal are *measurements* in *space* or *time*, *e.g.*, statures of men or ages at death, and *mere numbers*, *e.g.*, yearly deaths; or (2) *ratios;* such as that of male to female births, or rates of mortality.

(1). In the first case it has never been doubted that the modulus must be elicited by an examination of the observations (cannot be predicted from the mere knowledge of their number). But the different cases which the inquiry presents have not always been sufficiently distinguished. (α). There is first the case in which our data, without manipulation, fulfil the law of error. In this case the first step is to find the modulus of that probability-curve under which the unmanipulated observations range. From this result it is a very short step to the modulus for the mean of m observations. To find the modulus for the un-meaned observations the following appears to be the preferential method. Take the arithmetic mean of all the observations. Form the difference between each of the observations and the arithmetic mean: say, e_1, e_2, &c., e_n. The sum of the squares of these differences multiplied by 2 and divided by the number (or the number* less by unity) of the observations, say, $\frac{Se^2}{n}$ or $\frac{Se^2}{n-1}$, is equal to the *square of the modulus*, a quantity which it is proposed here to name the *fluctuation*. This is the method which is most advantageous in respect of accuracy. But, when the observations really conform to a probability-curve, there are several formulæ for the modulus which are little inferior to the above in respect of accuracy, and two of them which are superior in respect of convenience. If we call the preferential method the method of mean square of errors, one of the rival

* These and other mathematical points will be more fully discussed by me in an essay on "Observations and Statistics," which will be published in the "Transactions of the Cambridge Philosophical Society," 1885.

methods might be called the method of mean first power; the other the method of mean zero powers. The former proceeds thus: As before, take the arithmetical mean and differences therefrom. The sought modulus is equal to $\sqrt{\pi}\ \frac{Se}{n}$. This is the method employed by Airy in eliciting the modulus for a group of 636 observations* of the Pole star's position. The consilience of this method with that of the mean square may thus be illustrated. For 25,876 measurements of American recruits given by Mr. Elliot,† I find the modulus by both methods 3·6 inches. The other method is that described by Mr. Galton in his article on *Statistics by Intercomparison* and elsewhere; the same in principle as that which was employed by Quetelet.‡ The essence of this method is to note the points between which are comprised quarters (eighths or other fractions) of the total number of observations, and then to equate the distances thus given by observation to the corresponding multiple of the modulus as assigned by theory. For example, if we take two points so that between them there occur half the total number of given observations, and outside each of them a quarter of the total number, the distance between these two points ought theoretically to be equal—is equatable—to twice the modulus $\times 0{\cdot}476$. The following example illustrates the consilience of this method with that of mean squares. For the 25,876 measurements of American recruits given by Mr. Elliot in the Report of the International Congress, 1863, I find the modulus by the method of mean squares 3·6; by the Galtonian method 3·7. The following example illustrates the consilience of the Galton-Quetelet method with that of the Mean (first power of) Error. By the former in the case of 683,000 Italian conscripts M. Perozzo finds the modulus to be the reciprocal of 10·6, *i.e.*, 0·09 (of a metre); by the latter, employing only half the observations (those below the mean), I find the modulus 0·09. ["Annali di Statis-"tica," 1878, vol. ii.]

The modulus for the individual observations having been found, the modulus for arithmetical means of m observations taken at random is given at once by the theorem that the square of the latter modulus is equal to the square of the former divided by m. The *fluctuation* of the means is inversely proportional to the number of observations which go to a Mean.

(β). We come next to the case where the observations do not themselves fulfil the law of error: for instance the ages at which 10,000 born into a stationary population die (column d_x of a life-

* Theory of Errors, Appendix.

† International Statistical Congress, 1863, p. 748.

‡ Letters on Probabilities, ch. xx. "Physique sociale," book iii, ch. i, p. 2.

table). Here there is no talk of finding the modulus for the individual observations. But it has been shown above that if we take the Arithmetic Mean (or certain other sorts of Mean) of m such observations taken at random out of the whole set, then the means so formed do fulfil a law of error; of which the modulus is now sought. Here a new principle of division is introduced: namely the nature of the operation performed on the m selected observations. First and foremost is the case where we take the arithmetical mean of the m values. In this case the fluctuation for the Means is given by the formula $\frac{2\,Se^2}{n}$; which is now not merely theoretically preferable to, but practically different from the other formulæ which in the former case (α) were applicable. Thus, in order to verify Dr. Guy's reasonings (in the ninth and fourteenth numbers of this *Journal*) as to the relative healthiness of different professions based upon a difference of about two years in the mean age at death of some hundred doctors and clergymen, it would be necessary to obtain the expectation-of-life for males (if possible professional males) at the age of 20 (or the later ages* specified in the data); then to take the differences between this arithmetical mean and each figure in column d_x from the age 20 to 100; form the sum of the squares of these differences, multiply by two and divide by the total number, *i.e.*, the number alive at the age of 20. The figure so obtained is to be divided by the number of clergymen or doctors whose mean age at death has been found. For in case β as well as α the proposition holds that the *fluctuation* of a mean is in inverse proportion to the number of observations which go to it. The calculation would of course require correction, since it presupposes a stationary population.† But it may not be without interest to indicate the safeguards which, even if this difficulty were overcome, such arguments would require.

Still under the heading (β) we have next to consider other ways of dealing with our m observations besides taking their arithmetical mean. The most important case is where we take the *median*, as it has been called, or *centralwerth*, of our m observations: that is the point on either side of which lie $\frac{m}{2}$ observations. If we form this kind of Mean for several sets consisting each of m observations, the means so formed will range under a probability-curve,‡ whose *fluctuation* is a function of a datum which

* It should be observed that if we started from the age of about 50, the observations would nearly fulfil the law of error as Professor Lexis has shown. The case would be (a) not (β).

† See "Assurance Magazine," vol. ix, p. 311.

‡ Laplace, "Théorie Analytique." Supplement 2, sect. 2. "Observations "and Statistics" (Camb. Phil. Trans., 1885), pp. 168, 169.

may be described as the central ordinate of the curve from which the m observations are taken. The sought fluctuation is to be equated to the reciprocal of $2my^2$, where y is the central ordinate of the said curve divided by its area.*

(2). So far of space and time measurements and mere numbers. It has been very generally taken for granted that a shorter method of ascertaining the modulus is applicable to statistical ratios; *e.g.*, the proportion of the number of male to the number of female births, or of the number of marriages to the number of the whole population (or at least the marriageable portion of it). It has been supposed that such numbers will have the same fluctuation as occurs in games of chance; which was described above at p. 182.

It is often implied that a ratio such as that of male to female births will present the same *predeterminate* fluctuation. *This identity, however, cannot be known beforehand.* It exists as a matter of fact in the case of the sex-ratio at birth. But it is not so in general in the case of birth-, death-, and marriage-rates. The existence of a law of error for such ratios depends upon a plexus of small causes, such as that above† described; and the fluctuation must be ascertained not by the analogy of games of chance, but by the method employed in case of measurements in time and space: the "physical" as distinguished from the "combinatorial" method according to the important distinction insisted on by Professor Lexis.

If we must use a metaphor derived from games of chance, let us not compare the fluctuations of a death-rate to the fluctuations in the proportion of white balls when so many balls are drawn at random from an urn containing white and black balls in a fixed ratio. Let us imagine an urn containing black and white balls in the given ratio; not separately, but in clusters, clusters of white balls and clusters of black balls. In this case the fluctuation of the ratio could not be predicted from the number drawn, as it would depend also upon the average size of a cluster. In the absence of that datum the fluctuation would have to be ascertained by actual inspection of the returns. For fuller illustration of the distinction between the "physical" and the "combinatorial" modulus, the reader is referred to the writings‡

* If we used some other *mean function* of m observations, *e.g.*, the sum of their cubes divided by m, in order to find the modulus according to which these *mean functions* group themselves, we must employ a formula given by Laplace. (*Cf.* Todhunter. Art. 1006.)

† See p. 185.

‡ "Einleitung in die Theorie der Bevolkerung Statistik" (Strasburg, 1875); "Massenerscheinungen . . ." (Freiburg, 1877); "Geschlechtverhältniss" (Jahrbuch, Na. Okoomie, 27); "Stabilitat statistischer Reihen" (Ibid., p. 32). "Moyennes "Normales;" *Annales de Démographie Internationale*, 1880.

If I ventured to make any criticism upon one whose authority appears to

of Professor Lexis, the one author* who has seized this important principle. This paper is much indebted to those highly original writings.

Case (2) having been identified with case (1) presents the same distinctions: according as the figures (α) do, or do not (β), conform to the law of error. If they do, the mode of extricating the modulus which we above called the method† of mean square has a theoretical superiority which seems to diminish just as the superiority of other methods in respect of convenience increases: namely, when the number of observations become very great. If the observations submitted to us do not conform to the law of error, then the method of mean square‡ has very generally a theoretical superiority which it is not safe to forego for the sake of practical convenience.

With the reservations thus expressed, the method of mean square may be regarded as *the* method of calculating fluctuation. As an example of its accuracy let us take a case in which we may know beforehand a modulus (of the "physical" species), which it is proposed to extract from given observations. Such a case is presented by digits, or sums of digits, taken at random from

me so great, it would be first that he seems to attach too much weight to the question (above noticed, p. 186) whether a set of observations do, or do not, fulfil the typical law of error. Suppose for instance that the number of persons during each year in a stationary population did not—as he shows that they do—fulfil the law of error in late life, what then? As above (p. 190) explained, we are no worse off in respect to the elimination of chance, provided only that the figures of column d_x are constant; which is equally true or equally false, whether the law of error be or be not fulfilled. The fulfilment of the law of error in such a case is the result of a certain degree of multiplicity in the causes at work. I venture to consider it a matter of secondary importance whether this comminution of causes has, or has not, been carried to a certain limit. I do not ignore the important difference for *practical* purposes between what Dr. Bertillon calls a "Moyenne "typique," and one which is merely "indice;" but I contend that the practical value of the former depends upon the fact that the constituent particulars cluster close about the Mean, not upon their conformity to the exponential law of error, the probability-curve. These distinctions will be explained more fully in the sequel to this paper.

These remarks relate only to the law of error with "physical" modulus. When Professor Lexis shows that the "combinatorial" rule is applicable, then no doubt he may be entitled to infer, from the fulfilment of this kind of law of error, an important fact, namely, a real proportion between some objective things—as it were black and white balls mixed up in an urn in definite proportions. (See p. 199.)

Secondly, I do not feel quite satisfied that, even with the reservations admitted by Professor Lexis, the modulus calculated upon the combinatorial principle is in general an inferior limit of the physical modulus. (See below p. 212.)

* Hain's "Statistik des Osterischen Reich's" may be referred to as containing many practical illustrations of the *physical* method.

† See p. 188.

‡ Assuming in anticipation of problem 2 that the Arithmetic Mean rather, *e.g.*, than (see p. 190) the Median is to be employed in dealing with statistical ratios.

mathematical and statistical tables. I have before me 280 sums each formed by the addition of ten digits taken at random. In so far as these sums may be regarded as ranging under a probability-curve the example belongs to the first case just distinguished; in so far as the pulverisation* of component elements has not been carried far enough the example belongs to the second case. In either case $\frac{Se^2}{280}$, the Mean Square of error, ought theoretically (since one digit occurs as often as another) to be 82·5. In either case the fluctuation of a mean of m sums (where m is large) must be twice the Mean Square $\div m$. In illustration of the first point I give the following result. The Mean Square of the differences between each of the 280 data and the presumably real Mean 45 is 79·9 (for the first 140 observations 80·4, for the next 140 observations 79·4). Had we taken the differences from the Arithmetical Mean† the general rule where we know of no real Mean—the above result would have been further from the theoretical value by about a unit.

To illustrate the point that the fluctuation diminishes in inverse proportion to m the number of observations entering into a Mean, I have calculated the mean square of error for 28 figures each the mean of 10 of the decades whose fluctuation has just been calculated. The mean square of error for these 28 means is 9 (in the first batch of 14 the mean square was 10, for the next batch 8). According to theory this half-fluctuation should have been the tenth of 82·5. It may be well to take another example of the diminution of fluctuation from a less‡ abstract region. Dr. Guy in the thirteenth number of our *Journal*, arranges 6,400 observations, namely, ages at which persons mentioned in the Annual Register died, in several series. In the first series there are 128 groups each consisting of 50. The mean age at death for each of these groups having been found, there is given in Table VII, p. 38, the number of such groups which had each particular age as their mean (*e.g.*, there were 17 groups, for each of which the mean age was 67). The observations are then rearranged in 64 groups each consisting of 100 observations. Their number is continually divided, their size multiplied, by *two*. Now according to the theory here considered the *fluctuations*, or (twice) mean-square-of-error, appertaining to the respective sets of observations

* See p. 186.

† This deviation from the true mean is not more than might be expected as a result of mere chance, for the observed difference (between the Arithmetical Mean and the true value) is 0·4, and the modulus for the error of the Arithmetical Mean 0·8.

‡ See another example below, p. 212.

(the columns in Dr. Guy's table) ought to be in a geometrical progression whose ratio is $\frac{1}{2}$. Here are the figures (mean-square-of-error) for the first four sets of observations—

15·5, 8·5, 5·5, 2.

In Table IX Dr. Guy similarly rearranges a number of observations relating to attendance at hospital in groups of different sizes. The following figures, each proportionate to the mean-square-of-error for each set of observations (each column of Table IX) ought according to theory to be in a geometrical progression whose ratio is $\frac{1}{2}$—

6,912, 2,540, 1,120, 408.

It may be observed that, if in the last three illustrations we had, studying effect rather than convenience and a certain propriety, presented the quantities corresponding to *modulus*, rather than those of the order of *modulus squared* or *fluctuation*, the consilience between fact and theory would have appeared more striking.

Such is the apparatus afforded by the Calculus of Probabilities for the elimination of chance. But it must not be supposed that this mechanism is always available in its perfect form. We must often be content with much rougher indications of the degree of difference between two means which might have been expected and is nothing extraordinary, than that which is afforded by the regular extraction of the modulus. Still it is useful to have the ideal of proof before our eyes, even when we cannot realize it in practice. This function of the Calculus of Probabilities—to present an unattainable ideal—resembles that which the mathematical theory of Political Economy performs.

The uses and imperfections of this apparatus will best be illustrated by the discussion of some examples. Let us take as a first heading Anthropometry.

I. As a preparation to the solution of examples under this heading, let us ascertain what is the modulus under which the measurements of adult males in general may be expected to range. It is remarkable what uniformity there is in the results of this calculation. The following table sets forth the results which I have obtained by the method above called that of mean square of error:—

Anthropometrical Report, 1883, United Kingdom	8,500	3·6
" England	6,000	3·6
" Scotland	1,300	3·4
Elliot, Internat. Stat. Cong., 1863, American Recruits....	25,800	3·6
Ibid. Selected. p. 750.....	761	3·7
Bodio, Bulletin Acad., Belg. tom. xxvii, 1869	470,000	3·7
Roberts' Rep. Brit. Assoc., 1881, p. 237, age 25–30	1,935	3·4
" 30–40	2,152	3·7
Baxter, United States War Depart., American Recruits	315,620	3·8
Gould apud Baxter, Th., p. lxxxi	?	4·3

The first column of this table contains the authority and description, the second the approximate numbers of men observed, the third the modulus in inches as calculated by me (without intercalation or other reduction) from formula $\sqrt{\frac{2Se^2}{n}}$. It may be observed that the most exceptional modulus is that presented by Mr. Gould's observations. Query whether this is due to the carelessness which Dr. Baxter ascribes to many of those observations?* That Dr. Baxter's own observations yield an inaccurate result is doubtless owing to the fact that his unit is very large, *two inches.* Our method is too rough for his unreduced data.†

These results are confirmed by those of M. Perozzo ("Annali di "Statistica," vol. ii, 1878). He finds the modulus, for each of ten provinces, and for the whole kingdom of Italy, 3·7 inches.

Of course it could not be assumed beforehand that the modulus of the measurements of contemporaries,‡ and of male adults in general, as in Nos. 1—3, would be so nearly identical. Still less can it be assumed *à priori* that the modulus for particular § classes, *e.g.*, criminals and lunatics, is the same as for adults in general. There seems however good grounds for thinking that in fact approximately this is the case.

Armed with this result, let us attack some of the problems put in the Final Report of the Anthropometric Committee (British Association, 1883). Ex. 1. In Table VII of the report referred to it is stated that the (arithmetic) mean height of 2,315 criminals differs from the mean height of 8,585 members of the general adult male population by about 2 inches. To find whether this

* Medical Statistics (U. S. War Depart.), p. lxxvi.

† By a method appropriate to such imperfect data, Professor Unwin has reduced Dr. Baxter's observations to a probability-curve of which the modulus is 3·7 inches.

‡ There would be a material difference between these fluctuations, supposing, as Mr. Danson suggests (*Statistical Journal*, vol. xxv, p. 26), that the crop of men, so to speak, born in one year was much better in quality, of a higher average stature, than for another year.

§ *Cf.* below, p. 203.

difference in figures is indicative of a real difference in the condition of the compared classes. By the above formulæ given, the modulus for the difference between the two means (on the supposition that the 2,315 were a random selection from the general population) is $\sqrt{\frac{13}{8,585}+\frac{13}{2,315}}=0{\cdot}08$ nearly. Thrice this modulus 0·25 falls far short of the observed difference between the two means; which therefore certainly is not accidental, but indicates a law.

Ex. 2. According to the same table the difference between the mean statures of 98 members of the Royal Society and 100 Sheffield was 4 inches. Is this difference accidental? The modulus for the difference is $\sqrt{\frac{13}{98}+\frac{13}{100}}=0{\cdot}5$ nearly. Three times this modulus amounts to only 1·5, while the observed difference is 4, and is therefore significant.

Ex. 3. The mean height of 1,409 lunatics differs from the mean height of 8,585 adults of the general population by 2 inches. (Ibid.) Here the touchstone modulus is $\sqrt{\frac{13}{8,585}+\frac{13}{1,409}}={\cdot}1$. And as 0·3 falls far short of 2 the observed difference is important.

Ex. 4. In Table XIII of the same report there is a comparison between the mean height of boys aged 11—12 belonging to the upper middle class towns and to factories towns. Two hundred and ninety-four of the former and 341 of the latter class having been measured, their means differed by about 2·3. Was this difference accidental? Here we must not too hastily presume that the modulus which has been found for the general adult population is applicable to the population under age. To determine this point in this (and several similar cases), I applied the method of mean squares to the returns under consideration. In the present case I found for the square of the modulus (instead of the usual 13) for the upper middle class towns 12·72, for the factories towns 10. The numbers upon which this particular calculation of modulus is based being not very great, the difference in defect might be accidental. But from other observations and reflections I am inclined to think that boys have a smaller modulus than men. Accordingly we shall be quite on the safe side in using the normal figure 13 in the case of schoolboys. The modulus of difference then is (less than) $\sqrt{\frac{13}{294}+\frac{13}{241}}=0{\cdot}3$; the treble of which, 0·9, is well below the observed difference, 2·3.

Ex. 5. The difference between the mean heights of 150 boys from *public schools country*, and 181 belonging to *artizans towns* was found to be 2 (*ibid.*). Here the respective fluctuations as calculated

by the method of mean squares from the observations themselves are 9·6 and 11·8 (instead of the normal 13). If we keep on the safe side as before we shall have for the required modulus $\sqrt{\frac{13}{150}+\frac{13}{181}} = 0{\cdot}4$ and therefore the difference very significant.

A mere inspection of the returns might not seem to justify so decided a conclusion, since the extreme height of the *artizans towns* is nearly the same as the extreme height of the *public schools.*

It must not be supposed from the preceding examples that the only function of the higher theory is to ratify the conclusions obtainable by simpler methods; though, if the distribution of appointments or other privileges were ever to be made according to capacity ascertained in part by anthropometry, it might be desirable to have a method not only uniform, and as it were impersonal, but also capable of distinguishing the degrees of evidence between reasonable probability and certainty almost mathematical. But indeed the method under consideration is not useful only, but indispensable in such a question as the following.

Ex. 6. To find whether men over the age of 30 are taller than those under that age (I word the problem so as to exclude the question not, without additional data, amenable to mathematical method: whether the supposed difference is more likely to be due to real growth, or the mere survival of the tallest men). As a first datum let us take the mean height of 1,576 men aged 25—29, compared with the mean height of 1,886 men whose ages range from 30 to 40 [Table XVI, "Final Report of the "Anthropometric Committee"]. Here the modulus of comparison is $\sqrt{\frac{13}{1{,}576}+\frac{13}{1{,}886}}$ or 0·12. The observed difference is 0·2. There is therefore some evidence, but much weaker than that which we have considered in previous examples, in favour of a real difference.

The effect of the difference in age would have been masked in the previous example if it were true that in the latter part of the decennial period 30—40 a decline of height sets in. This hypothesis is confirmed by the returns given in Baxter's "Medical "Statistics" (United States Department of War), vol. i, p. 19. As between two groups belonging to the ages 25—30 and 30—35 respectively the observed difference is 0·12, the modulus of comparison is 0·01. The difference therefore is real. The period 35—40 as compared with 30—35, shows a decline of 0·07. The modulus of comparison is 0·04. That there is a real difference is therefore probable, though not so certain as in the preceding comparison.

It is instructive to observe how the problem is treated by an able anthropometer not employing the mathematical instrument which the higher calculus supplies. Mr. Gould (at p. 108 of the "United States Sanitary Commission Memoirs") inquiring whether the observed differences of height "actually represent "some natural law, or can be regarded as fortuitous," almost entirely foregoes the confirmation of his views which is afforded by the principle which we are considering. It is not attempted here to obtain a conclusion on this question by an exhaustive examination of the data, but only to insist that no safe conclusion can be obtained without the appropriate method.

II. As a second class of examples let us take the subjects of the registrar-general's returns. (1). Under the heading of births let us consider the proportion between the numbers of male and female births. For reasonings on this subject we have the following important premises. The fluctuation of the ratio between the sexes at birth obeys the rule of games of chance, is calculable upon the "combinatorial" principle.* For example, let us consider the ratios between the number of boys and girls born in each of several English midland counties for several proximate years. Let the number of births in each county be about 6,000, and the mean ratio of males to females be 1,441 : 1,000. Then the divergences from that mean which is presented by one set of ratios, their fluctuation, is calculable with considerable accuracy upon the following hypothesis. Suppose an urn containing an indefinite number of white and black tickets mixed up in the proportion 1,441 : 1,000. Let sets each numbering 6,000 tickets be drawn at random from the urn, and the ratio between the numbers of black and white tickets be observed for each of these sets. The fluctuation of that series of ratios is very nearly the same as the fluctuation of the sex-ratios.

This discovery is due to Professor Lexis. It is highly important as proving what ought not to be assumed without proof that the idea of sortition, the rules derivable from games of chance, are accurately applicable to one province at least of human affairs. Professor Lexis's complete induction requires no additional proof. But by way of illustration I may be allowed to adduce some of my own observations which possess at least the merit of having been made in ignorance of the theory which they verify. In the following table each figure in the first column denotes the approximate number of births in each of several groups for which the sex-ratio was observed. For instance, the second figure, 1,000, means that I observed (in the registrar-general's returns) the number of male and female births, and found the ratio of the former to the

* See p. 191.

latter for several English districts, in each of which there were in the year under observation about 1,000 births. Each figure in Column 2 gives the modulus extracted from a set of ratios, such as I have just described. Column 3 gives the modulus as calculated upon the hypothesis of urn and tickets just above explained. I add some descriptive particulars.

Number of Births.	Modulus from Observations.	Modulus by Hypothesis.
200	193	208
1,000	73	93
6,000	38	38
50,000	14	13
110,000	8·6	8·9
810,000	4·0	3·27

The first figure is based on thirty-one observations (of sub-districts). The second figure of the second column, being founded on only fifteen observations, is not entitled to much consideration. The third figure was obtained in two ways. First by observing the returns for five midland counties for two decades of years. Secondly by observing the returns for all the counties (exclusive of London, and with the exception of Huntingdonshire, Rutlandshire, and Herefordshire) for four years—four of the registrar-general's vertical lines; and treating the larger counties as integer multiples of the average numbers of a midland county. It follows that the corresponding number in the first column has no pretension to accuracy. The fourth figure in the second column is based on Austrian statistics, extending over four decades. The fifth figure relates to London and Lancaster. The sixth* to all England.

I have satisfied myself that much the same fluctuation is presented by Belgian, French, and Prussian statistics of the sex-ratio, and—a point of some importance in the theory of the subject—whether the still-born are or are not included.

So far we have only shown that the fluctuations of the sex-ratio as between groups defined by space and time is calculable on the combinatorial† principle. But it may fairly be assumed that the principle holds for groups otherwise defined; for instance by the occupations of the parents. For, as it can hardly be accidental that whether we divide according to place or time (or both), we obtain the same fluctuation; so it is a reasonable assumption that if we divide according to any other attribute we shall obtain the same fluctuation. It seems a legitimate procedure to‡

* See note to p. 208.
† See p. 191.
‡ "Massenerscheinungen," p. 73.

ascend with Professor Lexis from the observed fluctuation to the hypothesis of some real distribution of particles, like the tickets of our lottery in the observed ratio; and then to descend from this hypothesis to facts not observed: namely, the fluctuation in the case of groups otherwise defined than by place and time. At any rate the fluctuation assigned by the combinatorial hypothesis constitutes according to Professor Lexis an inferior* limit—a datum sufficient for many of our purposes.

We have then here a particularly powerful touchstone whereby to test theories upon the subject under consideration.

Ex. 1. To test the theory that the preponderance of male births is affected by the ages of the parents. The observations on which this theory has been sometimes based,† consist of not more than 1,000 births, in which the ratio of males to females exceeds that which prevails in general by some 3 or 4 per cent. Now, as the modulus for this ratio in case of groups of 1,000 is almost 9 per cent., the observed difference does not exceed the probable error; it should excite no surprise, it constitutes no proof that in a group of 1,000 births the observed excess should have occurred. A similar remark applies to 3,882 Austrian observations which Wappœus‡ cites with approbation. The observed excess is say 2 per cent. (the Austrian Mean being 106), and the Modulus for a Mean of 4,000 observations is between 4 and 5 per cent.

Ex. 2. To test the theory adduced by Dr. Bertillon (in the article on Natalité in the "Dict. Enclyd. Medic.") that the sex-ratio is affected by the occupation of the parents. Most of the observations recorded by Dr. Bertillon are open to the objection just made. The observed difference hardly exceeds the probable error. No doubt some additional probative force is obtained by the employment of an operation belonging to our case B,§ namely cutting up two means, and observing that, one whole being in excess of the other, the parts of the one are respectively in excess of the parts of the other. Still I submit that this operation would have to be repeated very often in order to compensate for the absence of the other sort of evidence which we have a right to look for. To base a conclusion upon two or three indications of the summary kind just noticed, where the mathematical method is available in all its perfection, is very like what Aristotle calls "a mathematician employing "persuasive arguments."

Ex. 3. To test the theory that the sex-ratio varies with place. The existence of such a variation is obvious, even to the unmathe-

* But see p. 212.

† Art. Natalité Wappœus, "Bevölkerung Statistik" vol. ii. chap. vi.

‡ "Bevölkerung-stat.," p. 153.

§ *Loc. cit.* 40

matical statistician. But it requires mathematical theory to determine the degree of certainty to be attached to different comparisons. Statisticians have been too often content with repeating observations (of differences between Means) without attending to their weight. They are like uncritical historians in whose balance every authority counts for one. Even in Wappœus's valuable contribution to this subject the degrees of evidence are by no means sufficiently marked. Thus he* neglects a difference of 3 or 4 per cent. between British West Indian slaves and Europe; which, founded upon 200,000 observations, has a modulus of about 0·7 per cent., and is therefore highly significant. A touchstone is required to distinguish the precious materials from the hay and stubble.

Ex. 4. Variations of the sex-ratio from year to year. A secular change has been proved to prevail in England, France, and some countries. This variation is so notable, that it possibly may dispense with the sanction of the higher theory. Not so the less conspicuous time-fluctuations, which it was reserved for Professor Lexis to bring to light. His principle shows that the ratios between the male and female births of a great country for successive years cannot be regarded *exactly* as so many tickets drawn from an urn containing an indefinite number of tickets in a fixed proportion. The statistics of a great country show—what escapes notice as long as we consider districts only—that we must suppose the real proportion between the number of the tickets in the urn to be very slightly changed from year to year; secularly perhaps in a uniform direction of increase or decrease, but oscillating from year to year.

Ex. 5. To examine whether the sex-ratio is affected by the seasons. To decide this question (which I believe has been already answered in the negative by others), I found the ratios for each qnarter of ten years for all England (1870-79 inclusive). And, though it would have been allowable to deduce from the preceding theory the modulus for groups such as those under consideration numbering about 200,000, for greater security, and for the sake of illustration, I calculated the fluctuation for ten springs and similarly the other seasons separately. The calculations may be thus summed up:—

	Mean of Ten Years.	Fluctuation.
First quarter	1,040·4	44
Second „	1,039·4	40
Third „	1,037·5	42
Fourth „	1,040·1	29

* II, chapter vi, Appendix.

The modulus for the difference between any two means is found by adding the corresponding *fluctuations*, dividing by 10 and extracting the square root. In no case does the observed difference exceed the modulus. This indication of difference will not be diminished, if we compare the third, the apparently exceptional quarter, with the mean of the other three. That mean is 1,040. The modulus of comparison between this mean of three means and the mean for the third quarter is $\sqrt{1{\cdot}26 + 4{\cdot}2} = 2{\cdot}3$. The observed difference is 2·5. There is therefore a slight indication (a probability of about $\frac{8}{9}$) of a real difference in the third quarter. This conclusion would not be affected, if we treated the fluctuation for the fourth quarter as equal to the others, which seems a legitimate assumption in view of the preceding theory. There seems then a sufficient ground for pursuing the investigation further.

(2). Let us next consider how we should test a theory that any particular class was more addicted to marriage, had a higher "Matrimoniality," to borrow a term from French statistics, than some other class. Here we shall not find ready to hand a predeterminate modulus, a universal picklock applicable to every case. If we contemplate that page of the registrar-general's returns which gives the number of persons marrying per 10,000 of the general population for different years and different counties, we shall find a very different fluctuation between figures lying along the same vertical, and those on the same horizontal, line. Each of these fluctuations, calculated according to the usual rule, afford a means of testing certain theories. To take a fanciful example: if it were observed that among 200,000 fair-haired persons in the midland counties there occurred in one year 150 more marriages than among 200,000 dark-haired persons in the same part of England in another year, the difference might safely be pronounced accidental. For it falls well within the modulus for the time-fluctuations of the matrimoniality in midland counties. But how are we to proceed if our groups of fair-haired and dark-haired persons have been taken from the same county in the same year; or at random from different years and different counties? how will the registrar-general's returns assist us here?

The following is, I think, an appropriate conception. We may regard the fluctuation presented by the registrar-general's horizontal lines as made up partly of a time-fluctuation which we may call C_t^2, and partly of a fluctuation independent of the year, which we will call C^2. The conception might be illustrated by an* urn containing an indefinite number of white and black tickets

* This metaphor is not to be understood as implying that the "combinatorial" rule is applicable to marriages. The urn may be of the species described on p. 191.

in proportion of about 14 : 986, a ratio which is slightly altered from the year. The fluctuation presented by sets of say* 3,000 tickets drawn at random every year from this urn would consist of two parts: that due to the change in the real ratio of the number of the tickets in the urn, and that due to a random selection. Similarly the fluctuation presented by the vertical lines may be regarded as made up of a place-fluctuation C_p^2 and the same C^2. The fluctuation presented by diagonal lines is $C_t^2 + C_p^2 + C^2$. Now, when we are comparing groups belonging to the same place and year, the influence of the first two fluctuations becomes small. And it may be shown that the same holds true for large groups formed by random selection from different years and counties. The third fluctuation alone cannot be eliminated. How is it to be discovered?

I have attacked the problem by methods which I hope to describe at the next meeting of the British Association. For the sake of fixing the ideas, I state here provisionally the result of this still incomplete calculation. The difference between the mean matrimoniality—expressed as the number of married per 10,000—of two groups of persons of all ages numbering respectively N and N^1, and not affected by time- and place-fluctuations above described, is a significant and not accidental difference, when it exceeds

$$20\sqrt{200{,}000\left(\frac{1}{N} + \frac{1}{N^1}\right)}.$$

It is to be noticed that this formula, even if it were calculated more accurately than it is, would still give at best but an approximate value. A theory which passes this test is not certainly important; a theory which does not pass the test is not certainly unimportant. To illustrate this point, let us revert to first principles, and consider how the *law of error* arises, *e.g.*, in a case put by Mr. Galton, fruit of various sizes. If the pears of a garden have different sizes with a frequency conformable to the law of error, this result is presumably due to intermixture of causes; some numerous and separately uninfluential—thoroughly pulverised as it were; some standing out as more individually important, such as the aspects of the different walls, the different soils, and so forth. Now if we take a perfectly random selection of these fruits—for example, those blown down by a storm—the specimens so selected will conform to the law of error which prevails in the garden. But, if we select the pears on one of the walls, it may well be that the divergence of these pears from their mean will be represented by a less (or more) divergent curve than that which represents the

* About the number of marriages in a midland county.

garden as a whole. The curve for a particular wall may be included under the general curve in the manner indicated by fig. 4; where the peaks only of the included curves are represented.

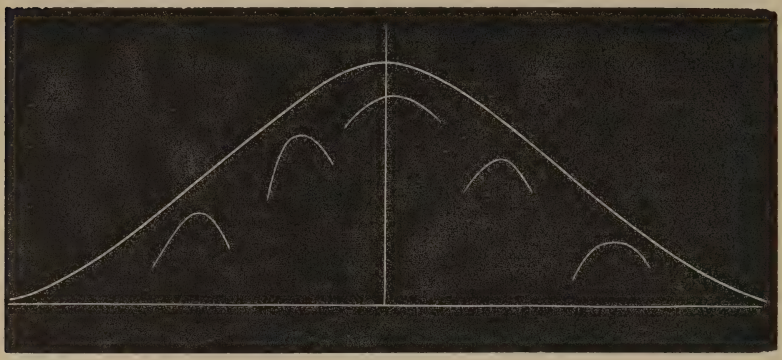


FIG. 4.

To ascertain whether the walls from which two baskets of pears have been gathered have important differences of aspect, it would be desirable, if possible, to obtain the fluctuation of pears growing on the same wall; preferably for the particular walls under consideration, or at any rate for several other walls; walls in general, as distinguished from the fluctuation for the whole garden. If we employ the latter number, we may pronounce that there is no difference between the compared aspects, when there is a significant difference.

Similarly, if black and white hair had really a causal relation to matrimony, it might happen that the fluctuation, as ascertained for the general population, would be too wide.

To take a more practical illustration under the heading of (3) Deaths.

Ex. 1. To test the registrar-general's conclusions concerning the comparative healthiness of different occupations. These conclusions are based upon differences to the extent of about 0·3 per cent. or more in the rate of mortality of males in different occupations, at various periods of life, ages 25—35, 35—45, and so on. The number of observed deaths on which the calculation of death-rate is based ranges from between 12 and 20 to 300 and upwards. I have endeavoured first to elicit from the returns relating to males in general, the fluctuation of mortality for the general body of adult males at the age of 25—35; next, from returns relating to occupations, the fluctuation of death-rate for a body of adult males aged 25—35 *belonging to the same occupations*—for a wall as distinguished from the garden, to use my former illustration. The results of these calculations are nearly

coincident. They derive additional confirmation from being nearly equal—not only to each other—but also to a third result, the fluctuation calculated upon the hypothesis of sortition, the "combinatorial"* as distinguished from the "physical" method. This coincidence need not surprise, when it is remembered that Professor Lexis found in many cases that deaths at certain ages fluctuate as I have said, and are distributed just like damnatory lots at random taken from an urn.

"Omnium
"Movetur urnâ . . . Sors."†

The conceptions of mythology and statistics coincide.

Without committing myself to a figure, which would have to be revised upon the issue of the registrar-general's next supplement, I think it might be safely said that with respect to the age-period 25—35 a difference of just 0·3 per cent. between the mortality in a certain occupation and that in all occupations is, if based upon a number of deaths below 20, insufficient to evidence a difference of healthiness in occupations—the indication being taken by itself and without that concatenation of evidence which will be noticed in the‡ proper place. For 60 deaths, the difference of 0·3 per cent. is with great probability significant of real difference in the conditions of the compared occupations. When therefore the registrar-general asks why it is that§ young farmers are less healthy than the industrial class in general, he is not asking a question like that which Charles the Second proposed to the Royal Society. The fact for which the registrar-general requires an explanation does exist—namely, an extraordinary event, one hardly to be accounted for by chance. For 200 deaths as, in the case of several selected occupations specified in Table 63 a difference of 0·3 per cent. and even less, amounts to practical certainty. *A fortiori* for larger numbers, such as the butchers and publicans present.

Ex. 2. To test Mr. Neison's conclusion concerning the unhealthiness of drinking. This conclusion rests on a difference from 3 to 5 per cent. at the age-period 25—35, in the mortality calculated upon some 1,500 lives exposed to risk. Only he who has realised that for those numbers a difference of say 1 per cent. would constitute that factor of the modulus of comparison which corresponds to practical certainty, can appreciate the crushing weight of probability which is carried by a difference of 4 per cent.

* See p. 191.

† The omitted words, "*serius ocius exitura*" (almost inconsistent with the notion of pure sortition), are not applicable.

‡ See p. 215.

§ Supplement, 1875, p. lvii.

Ex. 3. To examine whether there has been any significant change in the rate of mortality for the general population during the years 1838-79 in England. Here we have not to disentangle implicated fluctuations. It suffices to calculate the modulus for the registrar-general's returns given in Table 2. Let us take two periods of twenty and twenty-one years respectively, omitting the year of cholera 1849 (though its admission would not affect our result). For the first period the modulus* squared is 182; for the second period, 160. Therefore the modulus of comparison is $\sqrt{17} = 4$ nearly. The observed difference is $2\frac{1}{3}$. There is therefore but the faintest indication of a substantial difference. I have found a similar result for the mortality of males in England during the same period.

It is submitted that this method of dealing with such problems is much more correct than that employed by Wappœus.† The returns which he gives do not indicate any material change. The whole period of thirty-nine years being divided into two of twenty and nineteen respectively, I find for the modulus of comparison about twelve, and for the observed difference less than a unit!

However, it is not sufficient to compare the first half of the series with the second half. We ought to take other fractions, provided that they are reasonably large. I have done so in the case of the mortality returns for all England, without impairing the result above given. For example, if we take the first twelve and the last twelve of the whole series, and omit from the first group the very exceptional return, 251 for the year of cholera 1849, the modulus of comparison is 1·5, and the observed difference 0·5.

This empirical determination of the groups to be compared is doubtless sufficient for practical purposes. Yet, considering the passions and interests connected with inquiries of this character, it might be desirable to have a procedure formal and impersonal, and avoiding all appearance of manipulation; such as may be afforded by the mathematical method of drawing the most probable line through a given number of points. But this is one of the topics which must be reserved for a fuller treatment of births, deaths, and marriages.

III. Our next class of examples is miscellaneous. Let us first consider Jevons's observation‡ that the number of bankruptcies

* It is interesting to observe that the values of the moduli thus given by the method of mean square of error agree with the results of the mean error ($Se\sqrt{\pi \div n}$), which are 14·25 and 13·8 respectively, thus showing the *law of error* to be fairly well fulfilled by the death-rates.

† "Bevölkerung-statistik," p. 222.

‡ "Commercial Fluctuations," p. 9.

is greater in the second month of the quarter than in the first or third. The numbers for the first, second, and third quarters over fifty-five years are respectively 24,976, 28,391, 26,427; showing a preponderance in the second quarter of some 14 per cent. Now in general such an extent of difference between means does not necessarily indicate a law. For the modulus may be as much as 30 per cent., and therefore the probable error about 14 per cent. I find the modulus for yearly rainfall to be about 30 per cent. of the mean of a great number of years, and accordingly a difference of 14 per cent. in any particular year would not show that any exceptional agencies had been at work. When however we are concerned with* *frequency of occurrence* as distinguished from *measurements*, then perhaps the general experience of the statistician may be competent to pronounce that certain degrees of divergence between means of so many thousand is never accidental. One of the most fluctuating of phenomena is death from diseases of the skin; according to† Dr. Guy. Yet (according to my calculation), if we took only 120 of such deaths, we should find the fluctuation reduced to that degree at which 14 per cent. (of the average number of deaths) is the "probable error." Exs. 3, 4, and 5 below illustrate this remark. *A fortiori*, if our sums are made up of many thousand events. Professor Jevons therefore is justified in concluding off hand that there is something in the difference which he observes.

To verify this, I have ascertained the modulus for sixty-four first months and for sixty-four second months taken from several, not always consecutive, years. The fluctuation for a month is found to be from 1,600 to 2,000. Accordingly the fluctuation for the mean of two hundred and twenty months (fifty-five years × four quarters) is about 8 or 9. The fluctuation for the difference of two such means is about 18. And the modulus of comparison not greater than 4·5. Now the means for the first and second months being respectively 113 and 129, the observed difference is near four times the modulus. Professor Jevons's conclusion is therefore abundantly justified.

The modulus for a month having been ascertained by examination of the observations for two months of the quarter, we‡ may assume the same to hold for the third month—at least after taking a sample from the third series of observations by way of verification. Accordingly, without further trouble, we conclude that the

* See p. 188.

† *Statistical Journal*, vol. xviii. I have found that the order of phenomena arranged in a scale of fluctuation, as defined by the mean square of error, is much the same as that which Dr. Guy, defining "fluctuation" as the distance between maximum and minimum observations, has given.

‡ Compare the remarks at pp. 210 and 213.

excess of the mean second month over the third, being twice the modulus, is not accidental.

Ex. 2. A second example is afforded by Professor Jevons's remark* that there is "no great difference" between the amounts of bills in different quarters during the years 1830-53; the difference in fact being some 3 or 4 per cent. Professor Jevons must be understood to mean that such a difference in such a matter may for practical purposes be neglected. But for the purpose of science, the discovery of a difference in condition, a difference of 3 per cent. and much less may well be important. The total weight of a regiment containing 1,000 men, all taken without selection from the general adult English population, to which the measurements of the† Anthropometric Committee relate, would not be likely to differ from the average weight of 1,000 men, that is 70·5 tons, by more than 1 per cent. of that Mean.

The theory of the modulus must therefore be invoked. There emerges here a difficulty, that the amount of bills cannot be regarded as fluctuating throughout the twenty-three years about a point, but increases secularly. This difficulty may be avoided (where the secular increase is not very great) by extracting the modulus for periods of a few years. Proceeding‡ thus with a part of § the statistics given by Tooke I found the average fluctuation for the quarterly amount of bills to be about 100 millions. The Means of the nineteen first quarters and nineteen corresponding second quarters which I examined were respectively 67 millions and 64·6 millions. The observed difference is 2·5 millions. The modulus of comparison is $\sqrt{10 \cdot 5}$ millions. There is therefore "no "great difference," as Professor Jevons says; still a slight|| indication of a real law—enough to require the continuation of the inquiry, if the subject repaid the trouble.

Ex. 3. Our next example will be taken from a species of industry which has not received much attention from statisticians. I allude to the image of trade which is presented by wasps entering and issuing from their nest. The exports and the imports fluctuate with remarkable regularity. This appears from the following table, the observations contained in which were made by me at Edgeworthstown, Ireland, September, 1884. They were made on different days at different hours. They all relate to the same nest.

* "Commercial Fluctuations," p. 169.

† Final Report, Table I.

‡ I followed the same plan in calculating the modulus of the sex-ratio for all England given at p. 199.

§ Omitting the years of commercial crises.

|| This suggestion is corroborated by the method of case B (p. 213).

Number of Observations.	Mean.	Modulus.
22	26	7
21	24	10
22	28	8
17	33	8·5
20	26	10
16	25	8
13	40	7
21	42	9

In this table the figures in the second column denote mean total traffic (exports + imports) per minute. The first column denotes the number of minutes over which each set of observations extended, the number of observations which go to each Mean. The third column denotes the modulus extracted from the corresponding observations by the Method of Mean Square of Error. The Method of Mean Error gives nearly the same values.

It is clear that for that nest at that place and season, and for a traffic of from 25 to 40 per minute, the modulus 8·5* (the square root of the mean fluctuation) might safely be employed to discriminate between material and accidental oscillations. For example, on 4th September at 8 a.m. and at noon, the mean total traffic was respectively 42, 40; the corresponding observations numbered 5, 13. If in an insect republic there existed theorizers about trade as well as an industrial class, I could imagine some Protectionist drone expressing his views about 12 o'clock that 4th day of September, and pointing triumphantly to the decline in trade of $2\frac{1}{2}$ per cent. as indicated by the latest returns. Nor would it have been easy off hand to refute him, except by showing that whereas the observed difference between the compared Means is only 2, the modulus of comparison is $\sqrt{\frac{70}{5}+\frac{70}{13}}$, or 4 at least; and that therefore the difference is insignificant.

The gross fact that a decline of temperature is frequently accompanied with a decline of trade is obvious to ordinary observation. But it requires the mathematical instrument to discern the finer shades of correlation between industrial activity and meteorological conditions: the rise and gradual decline

"From morn to noon, from noon to dewy eve."

It is an interesting question, whether in this miniature trade there is an excess of imports. The modulus having been ascer-

* This result has been confirmed by observations made by me upon four nests at Edgeworthstown, August, 1885.

tained, both for imports and exports—the latter appears to be the greater—it is found that there is no such excess. The imports are paid by the exports.

These conclusions may be employed in reasoning about a nice question examined by Sir John Lubbock: how long an average voyage occupies? Consider three epochs separated by intervals of an hour; evincing by their successive means a continued decline of trade. As the imports of each later period are less than the exports of an earlier period, it seems impossible to believe that the return voyages which correspond to the out-voyages of the first (or second) epoch occur so late as the second (or third) epoch. A complete voyage then occupies less than an hour. That is doubtless a very superior limit. I have endeavoured to obtain greater precision by sprinkling a little tooth powder on a particular wasp, and observing his exits and his entrances. But these observations require to be ripened by another autumn.

Ex. 4. Returning to human society, we shall find that the attendance at a club of its members fluctuates about as much as the coming in and going out of the wasps. I take for example the number of diners at a London club where there is every day a *table d'hôte* open to all the members. I have extracted the modulus and the mean for the attendance on certain days of the week from observations extending over more than twenty weeks in the first half of the years 1883 and 1884—a fortnight at Easter and some days at Whitsuntide being omitted as exceptional. The modulus is found with considerable uniformity alike by the higher and more elementary method (mean square of error and mean error) to be 7·5; a little less, as might have been expected, when the mean is less.

We have here a test whereby to determine what extent of difference between the mean attendance upon different days of the week is material. It was once I believe a burning question in the domestic politics of the club (in view of a proposed change in the dinner-hour), whether the attendance upon certain days, for instance, Thursday, was materially affected by the presence of members intending to go on from dinner to a meeting of some learned society. Statistics show that there is a material difference between Thursday and Monday. But of course induction is required to suit the conclusion that the difference is due to the alleged cause. For ten weeks in the spring of 1883 the mean Monday attendance is 18; the mean Thursday, 28. The observed difference is 10; while the modulus of comparison is not greater than 3·5. The difference is therefore material. The spring weeks of 1884 show a less marked, but still significant, contrast between Monday and Thursday: an observed difference of 5·5; a modulus

of comparison 3. One defending the policy of the Committee, on the strength merely of the difference between the means for Thursday and Monday (without regard to modulus), might find it very hard to answer the objection that this difference was accidental. He might examine the documents, says someone, and observe whether the attendance on Thursday* was frequently greater than on Monday; and your method involves at least as much trouble. Granted, as regards a single comparison, that between Monday and Thursday. But let it be required to determine whether the difference between Monday and Wednesday is significant. We need take no more trouble, or only just as much as is sufficient to make sure that the fluctuation which has been found for Monday and for Thursday appertains to Wednesday also. But the unmathematical are still to seek. They have not gathered up the experience of the past (as to the extent of fluctuation) into a form available for the future. They are always beginning afresh their empirical tentatives.

A knowledge of the modulus for attendance at *table d'hôte* assists in forming a judgment concerning the difference between the mean total attendance in different years. For twenty-nine corresponding weeks in the first half of 1881, 1882, 1883, I find the total attendance respectively 16, 16 and 19. The modulus of comparison between two such means is approximately $\sqrt{\frac{2\times 60}{7\times 29}}$, say 0·8 at most. There is therefore an important difference between the spring of 1882 and 1883. To the plexus of causes which actuated members in 1882 has been added some new agency in 1883. It was doubtless the pleasure and curiosity incident to a change of the Club's premises which occurred in the autumn of 1882.

Ex. 5. From London clubs to Latin poetry is a violent transition; significant of the variety of interests which are amenable to the Law of Error. The number of dactyls in the hexameter affords a better example of the mathematical method than might have been expected. I extracted the modulus and Mean for ninety lines, which seemed a fair specimen of the "Æneid," those at the beginning of the fourth book. The Mean is 1·6, exclusive of the fifth foot; the fluctuation is 1·6 also. We have here a test of the Virgilian style. A passage of N lines is not Virgilian, if its mean differ from 1·6 by two or three times the modulus $\sqrt{1{\cdot}6\left\{\frac{1}{09}+\frac{1}{N}\right\}}$; provided that the opening lines of the fourth book may be taken as a sample specimen of Virgilian style.

To determine this question I observed 600 additional hexa-

* Our method B (1).

meters taken from the sixth book. The following table gives the results of the whole set of Virgilian observations :—

Number of Lines.	Mean.	$\frac{2\ Se^2}{n}$	$\sqrt{\frac{2\ Se^2}{n}}$	$\sqrt{\pi}\ \frac{Se}{n}$
90	1·65	1·58	1·25	1·33
90	1·58	1·33	1·15	1·34
90	1·41	1·50	1·23	1·22
90	1·63	1·45	1·20	1·28
90	1·76	1·42	1·20	1·18
90	1·69	1·04	1·02	1·11
90	1·69	1·41	1·19	1·28
60	1·61	1·54	1·24	1·33
General mean....	1·62	1·41	1·19	1·26

This table conveys many valuable lessons. First we learn that the test above found is fairly accurate. It suffices to discriminate the Virgilian from the Ovidian hexameter; which has an average of 2·2 and modulus 1·8. But the test must not be pressed too far, or we should find Virgil himself violating the canon of Virgilian style. The third Mean (in Column 2) differs from the General Mean by 0·2; while the modulus of comparison is $\sqrt{1{\cdot}4\left\{\frac{1}{90}+\frac{1}{690}\right\}} = 0{\cdot}14$ nearly. If we had taken the last thirty lines of the passage under consideration, viz., "Æneid" VI, 434—464, we should have found a still more marked exception to the general canon. Those thirty lines pathetically describe the "plains of woe" where dwell unhappy lovers :—

> "Lugentes campi, sic illos nomine dicunt."
> "The line too labours and the words move slow."

The gusts of passion to which the rhythm is accommodated cannot be treated as perfectly fortuitous. Nevertheless it appears that the causes at work are sufficiently numerous and independent to fulfil the conditions required for the elimination of chance. According to theory, if the fluctuation for single lines is 1·41, the fluctuation for the Mean of five lines, of thirty lines, and of sixty lines ought to be respectively 0·28, 0·047, 0·024. According to observation, calculated by the method of Mean Square of Error, the respective moduli are 0·32, 0·057, 0·03. Here then the eliminative process is as it were laid bare. The Means of, *e.g.*, five lines are observed in fact, as they were presumed by theory, to range according to a *modulus* between 0·5 and 0·6. That the Mean of any five lines should differ from the general Mean by a whole dactyl is proved to be an exceptional phenomenon, about as rare as an Englishman measuring 5 feet, or 6 feet 3 inches. An excess of two dactyls in the Mean of five lines would be as exceptional as an Englishman measuring 6 feet 10 inches.

Again, it is to be noticed that the modulus in this series of observations is rather more constant than the Mean. The *fluctuation* does not itself largely fluctuate. A similar phenomenon is presented by* anthropometrical statistics. It will be remembered that M. Perozzo found the same modulus for ten Italian provinces differing from each other in Mean stature.

Another interesting lesson to be derived from these statistics is that the modulus falls short of that which may be called the normal *écart*, that which is obtained upon the hypothesis of pure sortition. If we could imagine dactyls and spondees to be mixed up in the poet's brain in the proportion of 16 to 24, and shaken out at random, the modulus in the number of dactyls would be 1·38. Whereas we have constantly obtained a smaller number, on an average (the square root of the average fluctuation) 1·2.† My doubt‡ therefore whether Professor Lexis is right in fixing the normal "combinatorial" modulus as the inferior limit of the "physical" appears justified.

B. We come now to the second case of our first problem, that which is concerned not with a single comparison of means, but as above explained, with a concatenation of comparisons. This case presents two sub-cases: (1) where in each comparison we look only to the fact of excess or defect, and (2) where we take account also of the *extent* of difference according to the principles laid down in A. For example, in comparing several groups of men under 30, we may, with§ Mr. Gould, look only at the *sign* of each difference, or we may also take account of its *quantity*. The first process requires no illustration. It is only too familiar. For it is to be feared that many statisticians have not got beyond this operation. Their only idea of solving problem A is cutting up the means into several parts, and observing whether the parts of the one are greater or less than those of the other. To such the elaborate apparatus of mathematical theory may appear superfluous. They will regard it in much the same light as a certain powder which was once advertised as peculiarly efficacious for the destruction of insects. The advertisement directed that, having caught the insect, and holding him in a prescribed position between the thumb and finger, you should carefully administer the powder. Upon which some simple wight remarked that, when you had so secured the insect, you might dispense with the powder. An answer to this metaphorical objection is the best form, in which I can put some remarks upon the problem B.

* See p. 195.

† Analysis of the frequency with which purely spondaic and purely dactylic lines occur shows that both those extremes are rarer than, if the sortional hypothesis were correct, would be the case.

‡ Exclusive of the last two practically constant feet. § See p. 183.

First then, in the same vein of metaphor, it may be replied that this method does not require the insect to be caught. Or rather, after a certain number of the species have been observed, then we can effect our purpose without that trouble. Whereas the capture which simple common sense prescribes is sometimes impossible and generally laborious. It is impossible, when we are dealing with the *minimum visible*, the atom, of our statistics: such as the *sub-districts* of the registrar-general's reports. If we want to know whether a certain preponderance of male births in a particular sub-district and year is a significant or an accidental circumstance, we have no test other than the theory of the modulus. And even, where we might possibly apply the method of cutting up our means in order to extort an answer it may be exceedingly inconvenient. Suppose that a very high sex-ratio in Greece as compared with other countries is cited* in an abstract, the mathematical method tells us at once what to think about this return. But, to satisfy the elementary method, we should perhaps have to voyage to Thebes or Athens. And even, when the inquiry lies at our doors, the mathematical method has all the superiority which Milton ascribes to spirits over mortals, effecting "in an hour What "in an age they with incessant toil And hands innumerable scarce "perform." Let it be observed for instance that the ratio of boys to girls born in Derbyshire in the year 1862 exceeds all England by 55 (per 1,000). At one glance through the mathematical instrument we see that, as the modulus for the mean of Derbyshire as compared with all England is not over 25, the observed difference is important. But by the rival method we have laboriously to look at the numbers of boys and girls born in each district or sub-district of Derbyshire, and, dividing the former by the latter, compare the series of ratios with the mean of all England. We should find that in 6 out of 8 districts, 12 out of 18 sub-districts, there is excess (over the general mean).

That is about the minimum amount of trouble which the elementary method would involve; supposing that all the signs of the partial differences mere +. For it is to be observed that, as according to the elementary method, we look merely to the alternatives + or −, which for all we know beforehand are equally likely; so the probability in favour of law, accumulated by a series of differences all + is about $1 - \frac{1}{2^n}$. Accordingly the series must have at least from 8 to 16 terms to get up to the order of probability with which the higher method habitually deals: namely,

* See "Annales de Démographie," vol. i, p. 140. *Cp. Statistical Journal*, vol. xxxi, p. 161.

that probability which corresponds to an "observed difference" equal to two or three times the "modulus of comparison."

These considerations lead up to the *second* reply to the supposed objector. Even when we do resort to the elementary method, we may have after all to call in the higher theory to interpret its results. Suppose there were 40 sub-districts, and in 28 out of these preponderance was observed. What degree of probability is there expressed? The *law of error* must, I think, be invoked to give an approximate reply.

It would however in general be an inaccurate reply, in virtue of a consideration which forms our *third* answer to the objector, and introduces our second sub-case (2). When we have taken the trouble of collecting details, such as the above, the full lesson conveyed by them is not extracted by the simpler method. An example is afforded by the above* cited experiments in psychical research. Suppose the number of trials there mentioned, namely, 1,833, breaks up (as is the case, I believe) into some four series each presenting about the same proportionate excess of successful guesses above the fraction, which pure chance in the long run would present: that is $\frac{1}{4}$. Then, if we look only to the fact that excess has occurred four times, we have in favour of some agency† other than chance the moderate probability $\frac{15}{16}$. But, if we take account of the improbability that not only some excess, but so large an excess, should so often have occurred, we have the figure 0·99996; which amounts to certainty. Similarly the evidence in favour of the unhealthiness of certain occupations (*e.g.*, that of the needle makers) which is afforded by the fact that at *three or four* life-periods the mortality in that occupation exceeds the general mortality of occupied adult males‡ is enhanced by taking account, not merely of the *repeated fact* of excess, but also of the *extent* of excess. So again in the example lately given of the districts of Derbyshire, if (abstracting for a moment the two districts in which there was not an excess of males above the mean of England) we consider the evidence afforded by each method; the simpler method gives $1 - \frac{1}{2^6}$ or $\frac{63}{64}$, which is certainly a respectable probability. But the other method carries a far exceeding weight of conviction—some seven *nines* following a decimal point.

This conclusion is not much affected by the exceptional districts in which the ratio is below the Mean. For the defect

* See p. 182.

† The Calculus of Probabilities cannot decide whether the agency to which the submitted observations are due is some mysterious cause, or some sort of misrepresentation. See p. 183, paragraph 2.

‡ See Registrar-General's Supplement, 1875, Table 63.

is in both cases within the probable "error," and in one case the numbers are small. Still the example brings into view the nice question: how is such a minority to be treated according to the more exact method we are now considering (B 2)? One plan (which I have recommended in the case of* Psychical Research problem) is to rearrange our partial means without violent manipulation into groups, all presenting the same *sign*. For instance, the Derbyshire eight districts might so be rearranged in four or five groups. But, if the odour of cookery hangs about this process, the following may be suggested: Suppose there are m excesses and n defects. And (especially in the case when the excesses are not very different from each other and the defects not very large) let p represent the probability that an excess of the average size which has been obtained by those m means would have occurred by mere chance. Then by the usual rules calculate the probability P that an event of which the *à priori* probability is p† should occur by mere chance m times out of $m + n$. Then $1 - P$ is the sought probability in favour of law.

This method may be applied to the following example: Groups of men belonging to different States aged under 30 compared with corresponding groups aged over 30, show very frequently a defect to the extent of one modulus. The operation is doubtless very inexact. But what is required is not so much a numerical‡ result, as to appreciate the order of probability with which we are dealing. By taking account of the improbability that each partial Mean should have diverged to the extent of one modulus, we see that the accumulated improbability of the total result being due to mere chance (rather than a real difference of condition) is not, what Mr. Gould's procedure is content with, of the order $\left(\frac{1}{2}\right)^n$ but of the order $\left(\frac{1}{12}\right)^n$ where n is the number of differences with the same sign. For $\frac{1}{12}$ is the probability that an error taken at random should lie at least as far as one modulus from the centre of the corresponding probability-curve, on one assigned side of that centre. The abstract given by Dr. Baxter† above cited may be treated similarly.

The latter example sets off the higher method better than the former one. The special advantage of that method is where it is impossible or inconvenient to multiply returns indefinitely. It must be admitted that, when a very great number of compared means

* Cited above.

† When p is very small recourse may be had to the formula given by Poisson, "Recherches," Art. 81.

‡ Which indeed, in view of the difficulties connected with *à priori* probabilities, must always be regarded as somewhat illusory.

are given ready to hand, as in Mr. Gould's statistics just referred to, then Method B (1) is sufficient by itself, or at least, if slightly tinctured with the general idea embodied in our first section (A).

Here terminates* the discussion of the first† problem. My principal aim has been the practical application of the Law of Error. The theoretical points which are likely to be least familiar to the reader are: *first*, the proposition that the Law of Error is equally‡ applicable to the elimination of chance; whether it is, or is not, fulfilled by the observations themselves whose means we are comparing; *secondly*,§ the relation between two modes of determining the sought modulus, modes following respectively the analogy of physical errors and of games of chance; the former to be preferred when they differ, the latter important when they agree. No originality is claimed for these principles. The first is the theory of Laplace, the second is the theory of Professor Lexis.

DISCUSSION *on* MR. EDGEWORTH'S PAPER.

THE PRESIDENT said that perhaps Mr. Edgeworth's valuable paper had not been in the hands of the members sufficiently long to enable them to discuss its contents; but there were one or two members present who might like to make some observations upon the important problem which Mr. Edgeworth had worked out.

M. PEROZZO desired to thank Mr. Edgeworth for the important paper which he had read, and regretted that he had not had time to consider it as it deserved. So far as he had been able to give it his attention, it appeared to him to be a very important *résumé* of the question with which he had dealt. He should be glad if Mr. Edgeworth would state whether in his paper he had brought forward any new methods.

Mr. EDGEWORTH said he did not know that he had offered any new remarks, but perhaps they would be new to some readers. He had borrowed a great deal from Professor Lexis. The distinction between the combinatorial and physical modulus was he believed so recent as to be new to most hearers. In the summary at the end he had set down what had been said not for the first time, but less frequently than it ought to be said by statisticians.

* Here might be expected some discussion of the evidence in favour of law, which curves (or other graphical representations) afford. But the limits of extension imposed upon this paper compel me to pass over this topic with the remark, that the probability afforded by the repeated consilence of curves (*e.g.*, those representing commercial fluctuations and sun-spot frequency) seems generally to be estimated according to the principle of B (1), but that the principle of B (2) might with advantage be more largely employed.

† The second problem is the virtual subject of my essay on "Observations "and Statistics," "Transactions of the Cambridge Philosophical Society," 1885.

‡ See pp. 186, 191. § See pp. 191, 198.

La Statistique graphique.

Par E. Levasseur, *Membre de l'Institut.*

Je dois parler de la représentation des faits statistiques par les procédés graphiques, autrement dit de la statistique graphique, que nous pouvons définir :—"*l'expression des faits statistiques par des "procédés géométriques.*" Le sujet m'a été proposé par la Société de Statistique de Londres. Je l'ai accepté. Depuis dix-sept ans, je fais un fréquent usage de ces procédés dans mon enseignement, au Collége de France, au Conservatoire des Arts et Métiers et à l'École libre des Sciences politiques ; je les ai souvent employés pour faire pénétrer jusque dans l'enseignement secondaire et même primaire quelques notions relatives à la géographie économique. Je suis convaincu que l'emploi de ces procédés est très profitable aux études statistiques et surtout à la vulgarisation de leurs résultats, qu'il est bon, par conséquent, d'en propager la connaissance et de marquer les principales applications qu'on en peut faire ; et je pense, comme le bureau de la Société de Statistique de Londres, que la solennité de ce Congrès était une occasion favorable pour exposer la question.

Ne vous attendez pas cependant, Messieurs, à entendre dans cette conférence d'importantes nouveautés. Le sujet est connu, et je n'ai pas l'intention de discuter ou de renouveler les théorèmes sur lesquels est fondée la construction des graphiques.

J'aurais beaucoup plus à apprendre des géomètres que je ne pourrais leur enseigner moi-même sur cette matière, et, si je hasardais quelque démonstration, je fatiguerais inutilement l'attention de ceux qui ne sont pas géomètres.

Ce que je me propose, c'est de dire la raison d'être des figures en statistique, d'en essayer une classification et de mettre en lumière leur utilité par quelques exemples.

On peut dire que la statistique graphique est à la statistique numérique ce que, dans le drame, l'action est au récit. Horace a donné aux acteurs une règle que nous pouvons appliquer à notre sujet :—

> " Segnius irritant animos demissa per aurem
> Quam quæ sunt oculis subjecta fidelibus."

Et, détournant de son sens un vers de Boileau, nous dirions volontiers aux statisticiens :—

> " De figures sans nombre égayez votre ouvrage."

Les chiffres, en effet, sont des abstractions : quand l'œil les a lus, l'intelligence en saisit le sens ; mais elle ne le fait que par une

série d'opérations de l'esprit qui perçoit successivement chacun des nombres alignés en longues colonnes; elle a besoin, pour se rendre compte de leur relation, d'un effort que les plus habiles ne font pas sans peine. Les figures, au contraire, sont des formes sensibles, des images qui non seulement attirent et fixent le regard, mais permettent d'apercevoir et de comprendre tout un ensemble d'un coup d'œil et qui font sur l'esprit une impression plus vive, souvent même plus profonde et plus durable que les chiffres. C'est là un avantage considérable : c'est la principale raison d'être de la statistique graphique.

Celle-ci ne doit cependant pas s'enorgueillir outre mesure du rôle qu'elle est appelée à jouer et se faire illusion jusqu'à croire qu'il est le principal de la pièce. Il ne faut jamais oublier que le premier rôle appartient à la statistique numérique. Celui qui dresse une statistique, compte et additionne des unités; il les classe, en forme des groupes qu'il compare et dont il tire des moyennes; en un mot, il agit sur des nombres; il fait œuvre de recenseur et de calculateur. C'est par là qu'il faut nécessairement commencer; on peut même se borner là : c'est ce que les statisticiens font le plus souvent. Toutefois il est bon d'ajouter, en passant, que la science des nombres ne saurait suffire, et que si le calculateur n'est pas familiarisé, par la connaissance de la législation, des institutions et de l'état social des peuples, dans tous les détails de la matière qu'il traite numériquement, il est exposé à commettre de grossières erreurs, tout en présentant des opérations en apparence exactes, et à n'aboutir qu'à une œuvre médiocre, souvent même dangereuse par l'illusion de rigueur mathématique qu'elle produit.

La statistique graphique ne vient qu'après l'établissement de la statistique par les nombres; elle n'est qu'un mode d'expression et, par conséquent, elle est une forme subordonnée. Le géomètre et le cartographe reçoivent les chiffres; leur œuvre consiste à les transformer en figures qui en fassent mieux comprendre le sens et les rapports.

Pour atteindre ce but, la statistique graphique dispose de trois genres de procédés : les FIGURES, les CARTES et les SOLIDES. Nous allons indiques successivement les principaux procédés de chacun de ces genres.

I.—*Les Figures.*

Les FIGURES DE STATISTIQUE, qu'on désigne souvent par le terme plus spécial, mais moins intelligible peut-être pour le vulgaire, de *diagrammes*, comprennent les *points*, les *lignes*, les *surfaces*, les *diagrammes* proprement dits ou *courbes;* ces derniers se divisent en *diagrammes rectangulaires* et en *diagrammes polaires.*

I. Le POINT est le mode le plus élémentaire de représentation

d'un nombre par une figure. Autant de points que d'unités. L'art ne consiste guère qu'à les grouper dans un ordre qui en rende la lecture facile. Ainsi, les nombres 36 et 9 pourraient être disposés en carré :—

Dans ce cas, les points présentent un aspect à peu près semblable à celui des surfaces dont nous parlerons tout-à-l'heure et qui leur sont d'ordinaire préférables. Laissons la représentation des nombres par des points au boulier-compteur qui en est peut-être l'emploi le plus pratique et, sans en parler davantage, contentons-nous de signaler un ingénieux emploi que M. Cheysson a fait de ce procédé dans son "Album du tarif des chemins de fer," en marquant par des points disposés d'une certaine manière les tarifs spéciaux à chaque gare.

II. La LIGNE est d'un usage plus fréquent.

On peut toujours représenter un nombre par une longueur; mais, comme la longueur prise pour équivalent de l'unité est arbitraire, une seule ligne, représentant un certain nombre, serait une figure absolument dépourvue de sens. En voici un exemple. Si j'écris : les États-Unis ont 182,000 kilomètres de chemins de fer, je donne la notion d'un fait statistique. Si, voulant l'exprimer par une figure, je trace la ligne—

A ——————————————————————— B

en ajoutant : les chemins de fer des États-Unis ont une longueur représentée par la ligne A, B, je ne dis rien que l'esprit puisse saisir.

Si, comparant la longueur des chemins de fer aux États-Unis et dans les principaux États d'Europe, je dresse le tableau suivant pour la fin de l'année 1882 :—

États-Unis	182,350
Empire Allemand	34,380
Royaume-Uni	29,610
France	28,660
Russie	23,550
Autriche-Hongrie	19,740
Italie	9,040
Espagne	7,850

je puis utilement transformer ces chiffres en graphique, et, prenant le rapport de 1 millimètre pour 2,000 kilomètres, dessiner la figure suivante (voir la fig. A) :—

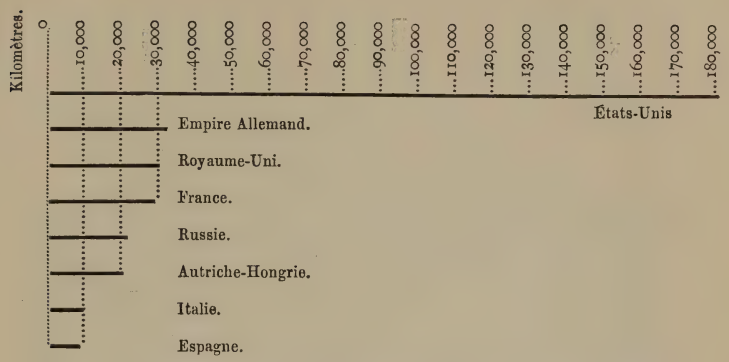


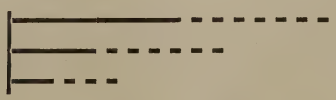
FIG. A. Longueur comparée des chemins de fer dans plusieurs États.

Cette figure a un sens. Si elle ne fournit pas une connaissance aussi précise que le tableau dont elle est tirée, elle fait une impression plus saisissante. L'importance relative des voies ferrées dans chaque État et la grande supériorité des États-Unis apparaissent d'une manière plus manifeste. L'évidence d'un rapport est précisément l'objet que souvent on se propose en employant les procédés graphiques ; mais il faut que le rapport existe et, par conséquent, qu'il y ait plusieurs termes à représenter.

On figure ces lignes soit par un trait fin, soit par un trait large qui devient ainsi un rectangle allongé ; c'est une question de dessin dont nous laissons le choix libre à l'auteur, en lui recommandant de chercher la forme la plus claire et la plus saisissante.

La longueur qu'il prend pour représenter l'unité dépend de l'espace dont il dispose et doit être telle que les différences qu'il veut mettre en vue soient aisément perceptibles. Elle ne sera assurément pas la même dans un livre et sur un graphique mural.

Si l'on doit figurer dans un même total des unités d'ordre différent, on peut le faire en variant la forme du trait fin, comme dans l'exemple suivant :—



Mais il sera plus facile d'exprimer cette diversité en se servant de rectangles diversement ombrés. Voici, comme exemple, la figure de l'accroissement de la population européenne en Algérie de 1833

à 1881 avec la distinction des Français et des autres européens. (Voir la fig. B.)

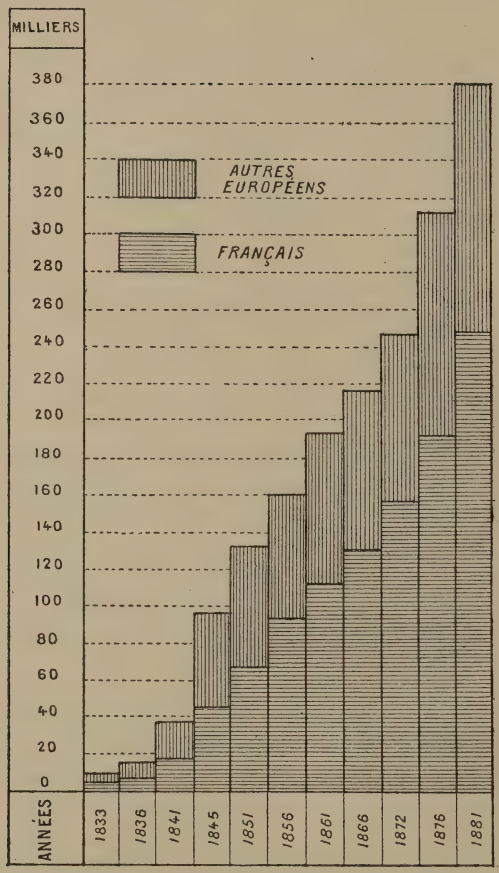


FIG. B. Population européenne en Algérie.

III.—On peut traduire les nombres par des SURFACES aussi bien que par des lignes; dans certains cas même, la surface est plus expressive. Voici, comme exemple, la superficie et la population comparées des États qui ont plus de 40 millions d'habitants, ou plus de 5 millions de kilomètres carrés de territoire. (Voir la fig. C, "Étendue et population comparées des États de la Terre," reproduite d'après notre Précis de géographie, "la Terre.") La figure est plus expressive que le tableau de statistique dont elle est tirée.

États.	Parties du monde dans lesquelles sont les possessions de l'État.	Superficie en millions de kilomètres carrés.	Population en millions d'habitants.
Empire britannique	Europe, Afrique, Asie, Océanie, Amérique du nord, Amérique du sud	22·1	304
Empire russe	Europe, Asié	21·8	100
„ chinois	Asie	11·5	372
États-Unis	Amérique du nord	9·3	50
Brésil	„ sud	8·3	13
Empire ottoman	Europe, Asié, Afrique	6·2 ?	42
France	„ Afrique, Asie, Océania, Amérique du nord, Amérique du sud	2·2	62
Empire allemand	Europe, Afrique	0·5	45

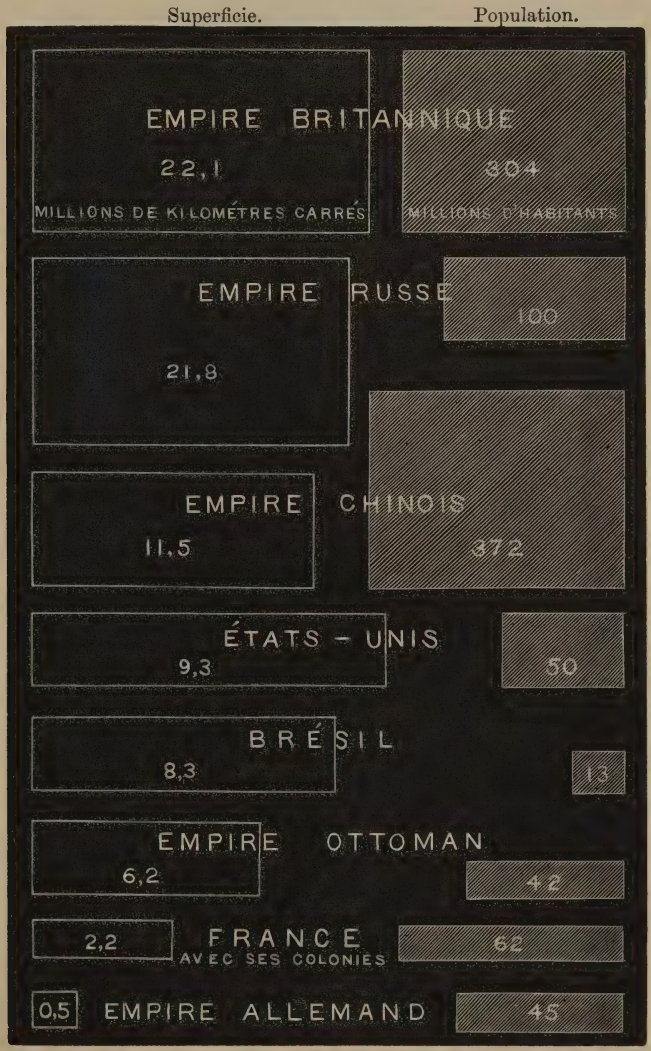


FIG. C. Étendue et population comparées des principaux États de la Terre.

Sur le côté d'une carte murale d'Europe destinée à l'enseignement, nous avons figuré chaque État par un carré tracé, autant que possible, à la place même que ces États occupent sur la carte d'Europe, et nous avons représenté ainsi par une suite de cartes de statistique le territoire, la population, le commerce, la marine. Cette série, que nous ne pouvons pas reproduire ici, est instructive, parce qu'elle montre du premier coup d'œil comment l'importance relative des États varie suivant l'aspect sous lequel on les envisage. Ainsi, on y voit que l'Angleterre a un petit territoire relativement à la Russie, que les différences entre les deux pays sont un peu moindres lorsqu'on envisage la population et que l'ordre d'importance se trouve renversé lorsqu'il s'agit du commerce et surtout de la marine, l'Angleterre étant représentée, sous ces deux derniers aspects, par une surface beaucoup plus grande que la Russie.

On peut, suivant les convenances particulières du sujet et de l'auteur, employer le carré, le lozange, le rectangle, le cercle ou même le triangle. Quelques auteurs se sont servis du triangle isoscèle, dans lequel ils réunissaient par couches superposées les divers éléments d'un tout, réservant aux moindres quantités la partie supérieure, afin de les rendre plus sensibles en leur donnant plus de hauteur ; ce procédé ne doit être employé que dans des cas exceptionnels et ne saurait être recommandé d'une manière générale, parce que les surfaces ne se ressemblent pas assez pour que la notion d'importance relative s'en dégage nettement. Les cercles, au contraire, que l'on peut diviser en autant de secteurs que le sujet l'exige, sont d'un emploi commode et fréquent. Nous leur préférons cependant d'ordinaire les carrés ou les rectangles, parce que l'auteur n'a pour ainsi dire pas de calculs à faire et de peine à prendre pour les tracer sur un papier quadrillé, et parce que le lecteur se rend plus aisément compte de la différence des aires de deux rectangles de même base ou même de deux carrés que de celle des aires de deux cercles.

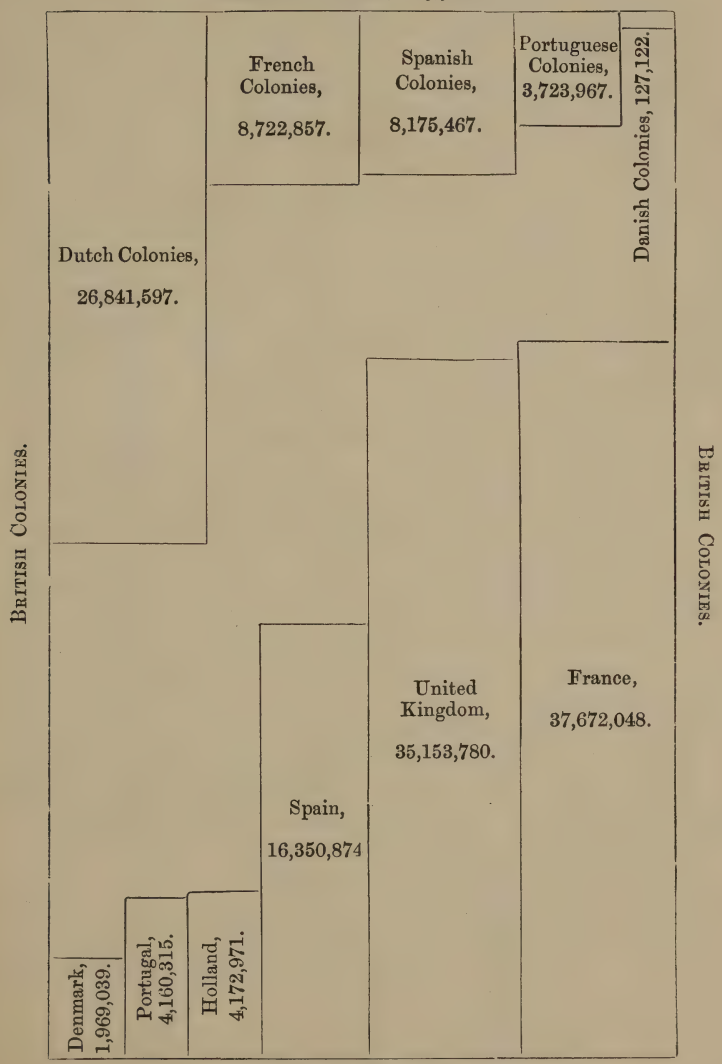
Dans le discours d'ouverture de la session de 1884-85, le président de la Société de Statistique de Londres, Sir Rawson W. Rawson, se proposait de montrer la grandeur des colonies britanniques. Il a pris pour représenter la population totale de ces colonies un rectangle occupant à peu près tout l'espace dont l'imprimeur disposait sur une page, et dans ce rectangle il a inscrit deux séries de rectangles représentant, d'un côté, la population coloniale des autres États européens (les derniers agrandissements de la France n'y sont pas compris) et, de l'autre, la population des métropoles européennes, y compris le Royaume-Uni. Tous ces petits rectangles se casent facilement dans le grand sans le remplir, et le lecteur qui voit cette figure conçoit immédiatement une haute idée de l'importance de l'Empire britannique : c'est précisement ce

que voulait l'auteur. L'editeur du "Statesman's Year-Book" a reproduit dans le volume de 1885 cette figure expressive, bien qu'elle soit d'un dessin très simple. (Voir la fig. D.)

POPULATION.

FIG. D. *Comparison of Countries and Colonies, to scale.*

BRITISH COLONIES, 213,918,000.



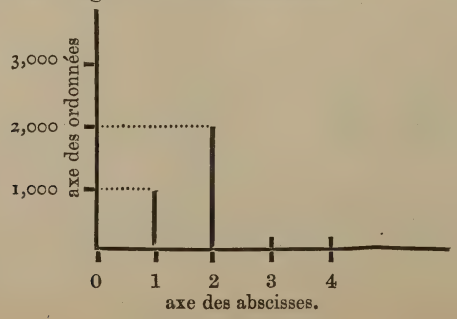
The entire figure represents the POPULATION of the BRITISH COLONIES.

IV. Le DIAGRAMME a des emplois plus variés que la ligne et la surface. C'est que les lignes et les surfaces n'expriment qu'un rapport simple entre deux ou plusieurs objets, tandis que la courbe exprime la série des rapports existant entre deux faits dont l'un est fonction de l'autre.

Ainsi, lorsqu'on dresse le graphique de la longueur des chemins de fer dans divers États, on n'a à considérer que la longueur relative des lignes ; on peut d'ailleurs les tracer horizontalement ou verticalement et les espacer à volonté. Mais, si l'on veut représenter le nombre des kilomètres de chemins de fer en exploitation aux États-Unis à la fin de chaque période décennale, l'espacement des lignes cesse d'être arbitraire, parce qu'il faut tenir compte à la fois de la longueur des chemins et du temps écoulé.

Pour simplifier la démonstration, supposons que nous ayons sous la main un papier quadrillé d'avance ; c'est sur un papier de ce genre qu'on dresse le plus souvent les diagrammes rectangulaires. Sur une ligne verticale, qui est l'axe des ordonnées, nous commençons par porter l'échelle du fait en fixant la longueur par laquelle nous voulons représenter l'unité de ce fait : c'est l'échelle des ordonnées. S'il y a 1,000 unités du fait, la ligne à tracer s'élevera du pied de la figure jusqu'à la hauteur du point où est marqué le nombre 1,000 sur cette échelle ; si 2,000, jusqu'à une hauteur double. Les faits sont en quelque sorte empilés les uns sur les autres et s'élèvent en colonnes proportionnelles au nombre des faits accomplis. En même temps, sur la ligne horizontale qui forme le pied de la figure en faisant un angle droit avec la ligne des ordonnées—d'où le nom de diagramme rectangulaire ou orthogonal qu'on donne à ce genre de figure—et que les géomètres nomment ligne des abscisses, nous portons des divisions égales pour représenter des temps égaux, et c'est en observant les espaces déterminés par ces dernières divisions que nous élevons à chaque période la ligne représentant l'intensité du fait.

Ainsi le statisticien, grâce à la géométrie, met à sa véritable place dans un certain cadre un fait déterminé par deux données numériques, comme le géographe met un lieu en sa place sur la carte à l'aide de la longitude et de la latitude.



Les colonnes de faits empilés se trouvent de cette façon rangées en ordre les unes après les autres, comme les faits le sont en realité dans la succession des temps. Nous obtenons donc non seulement l'expression graphique du fait à diverses époques, mais une mesure des variations que ce fait a subies dans le temps et proportionnellement au temps écoulé. Plus a été grand l'accroissement des voies ferrées durant une période, plus les lignes s'élèvent rapidement à la suite les unes des autres. Dans l'exemple que nous venons de choisir, les quantités s'ajoutant les unes aux autres, la série est nécessairement partout ascendante ; elle pourrait avoir un tout autre aspect si les faits représentés ne s'ajoutaient pas les uns aux autres.

La ligne des abscisses est indépendante de celle des ordonnées en ce sens que l'unité n'a pas besoin et souvent ne peut pas être représentée par une longueur égale sur l'une et sur l'autre ligne. Toutefois le choix de la longueur représentant l'unité n'est pas sans importance ; il doit être fait de manière à rendre sensibles les variations qu'il importe de faire connaître. Lorsque les variations du phénomène sont très accentuées, il n'y a pas d'inconvénient à les espacer sur la ligne du temps ; il convient, au contraire, de donner en général à l'unité une longueur plus grande sur l'axe des ordonnées et une longueur moindre sur l'axe des abscisses, si les variations sont faibles.

On peut à son gré élever verticalement sur la ligne des abscisses des lignes fines montant de la base jusqu'à la hauteur calculée ou des colonnes figurant autant de rectangles allongés. Des statisticiens ont conseillé d'employer de préférence le second procédé lorsqu'on représentait des moyennes. En realité, il n'y a pas de règle à imposer à cet égard : la clarté nous parait là, comme ailleurs, la règle suprême de la statistique figurée.

Voici une figure, empruntée en grande partie au travail de M. Sœtbeer sur les métaux précieux, qui représente la moyenne de la production annuelle de l'argent dans le monde (Voir la fig. E, "Production de l'argent par régions, de 1493 à 1880," extraite de notre Précis de géographie, "la Terre"). Ce n'est pas parce que le poids d'argent indiqué pour chaque période est la moyenne de cette période que le procédé des colonnes a paru préférable ; c'est parce que la colonne, pouvant être divisée plus facilement que la ligne, donne aussi plus de facilité pour représenter la part de chaque grande région dans la production totale.

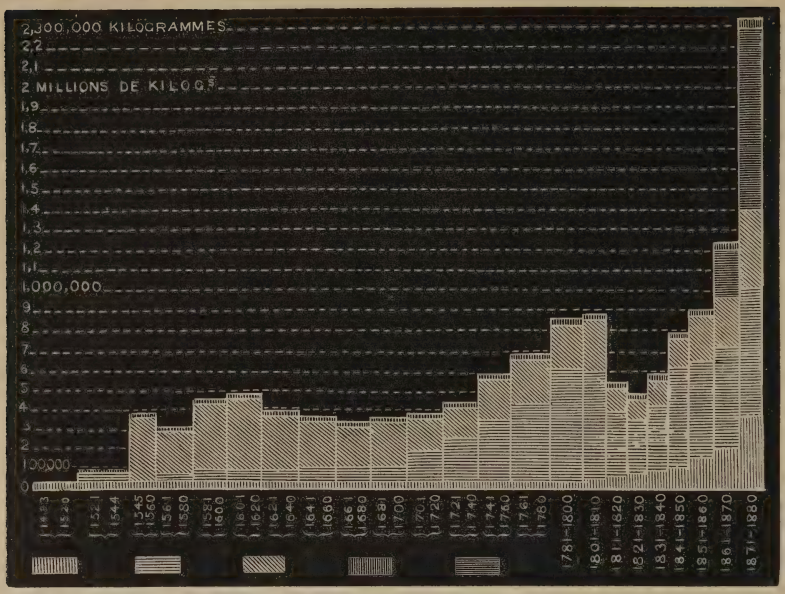


FIG. E. Production de l'argent, par régions, de 1493 à 1880.

La figure de l'immigration aux États-Unis depuis 1820, qui est d'un dessin plus sommaire, représente non des moyennes, mais des nombres absolus pour chaque année. (Voir la figure ci-jointe, fig. F, "Immigration aux États-Unis, 1820-83," extraite d'une conférence que nous avons faite à la Société d'acclimatation.) Cependant les colonnes lui conviennent aussi, parce qu'elles permettent de distinguer par des lignes différentes l'immigration totale ou brute et l'immigration nette, défalcation faite de l'émigration pour les anneés où la statistique fournit ce renseignement.

Ces deux figures ont une certaine éloquence démonstrative.

Sur la première, nous lisons très distinctement les influences successives qui ont agi sur la production et la valeur de l'argent, la conquête du Pérou, le progrès de l'industrie minière au Mexique pendant le XVIIIe siècle, les guerres de l'indépendance des colonies espagnoles, enfin l'exploitation des mines de la Cordillère du nord ; et nous nous rendons aisément compte de la situation défavorable dans laquelle se trouve aujourd'hui l'argent trop abondant sur le marché monétaire.

La seconde montre par des signes non moins manifestes les causes qui peuvent précipiter ou ralentir le courant de l'immigration. De 1832 à 1848, cette immigration subit l'influence des

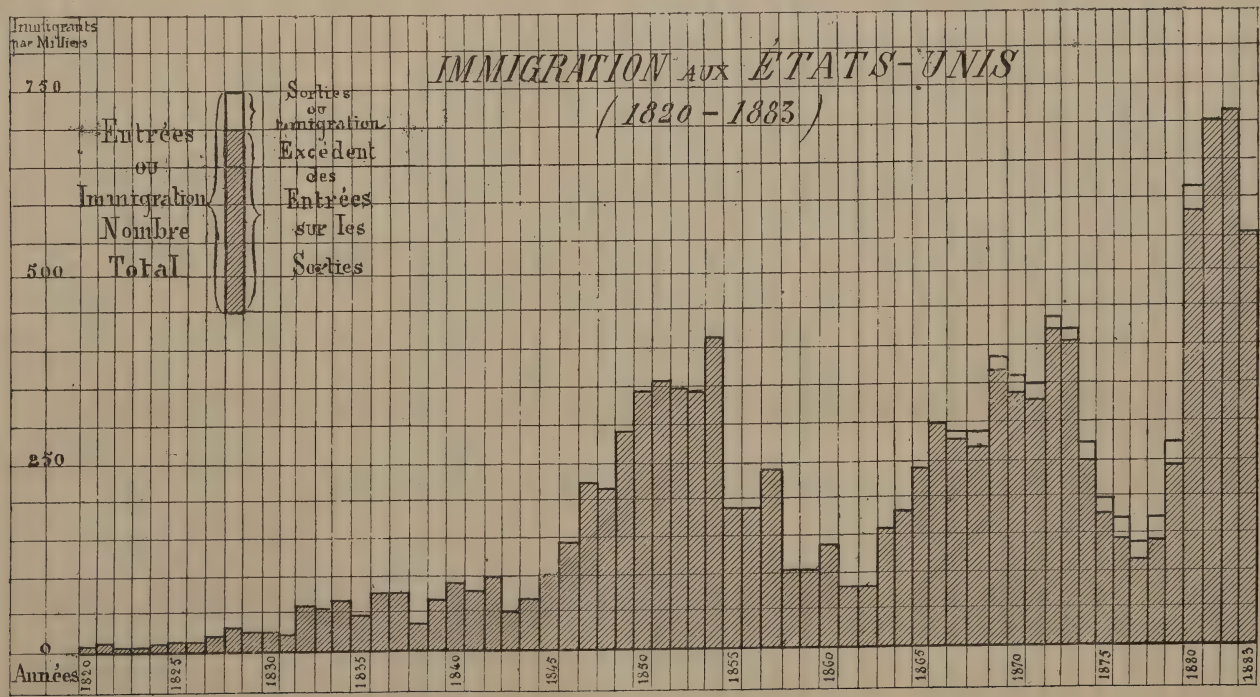

IMMIGRATION AUX ÉTATS-UNIS
(1820 - 1883)
Immigrants par Milliers
750
500
250
0
Entrées ou Immigration Nombre Total
Sorties ou Émigration
Excédent des Entrées sur les Sorties
Années
1820
1825
1830
1835
1840
1845
1850
1855
1860
1865
1870
1875
1880
1883

FIGURE F.

crises européennes, de la famine en Irlande, des progrès de la navigation à voiles et à vapeur; puis, de 1848 à 1855, celle des mines de Californie; elle diminue quand la fièvre de l'or a passé, et tombe très bas en 1861 et en 1862 sous le coup de la guerre de sécession. Cependant les voies de communication continuent à progresser, sur mer par les paquebots, sur terre par les chemins de fer, et facilitent l'immigration qui dépasse 420,000 en 1872. La crise de 1873 la fait encore une fois retomber très bas; mais, dès que l'équilibre économique est à peu près rétabli, un rapide essor porte à plus de 700,000 le nombre des individus qui entrent sur le territoire des États-Unis.

Il est assurément beaucoup plus facile d'apercevoir ces grands mouvements, et surtout de les faire comprendre à des lecteurs ou à des auditeurs avec des figures de ce genre qu'avec des tableaux de chiffres. C'est pourquoi nous recommandons, d'après notre expérience personnelle, l'emploi de figures d'un style mural aux professeurs, surtout lorsqu'ils s'adressent à un auditoire nombreux. Il n'est pas nécessaire, quand on ne dispose que de faibles moyens d'exécution, de les faire élégantes; il suffit de les faire claires. Souvent même il suffit de les tracer sommairement soi-même, avant ou pendant la leçon, sur un tableau noir quadrillé.

Dans une publication de la Commission centrale de statistique de Russie, je trouve un procédé d'exécution typographique que sa simplicité rend recommandable, surtout dans le cas où le graphique doit être réédité et subir des modifications. Il consiste à composer chaque colonne d'autant de petits carrés mobiles qu'il y a d'unités dans la colonne, en donnant à ces carrés des apparences diverses suivant le fait qu'ils représentent, et en employant des carrés évidés pour les parties à laisser en blanc. Ce procédé simplifie le travail de l'imprimeur et diminue la dépense des corrections.

Le plus souvent, au lieu d'élever des lignes verticales sur la base des abscisses, on peut se contenter de marquer les points d'intersection des deux coordonnées, et réunir ces points par une ligne continue: on obtient ainsi une COURBE. La courbe est d'une forme plus simple et n'est pas moins expressive que le diagramme par lignes ou par colonnes. Si ce dernier permet d'indiquer les éléments de même nature qui composent chaque total, les courbes ont, de leur côté, l'avantage de pouvoir être plusieurs sur une même figure, et d'indiquer ainsi la relation de plusieurs faits de nature diverse. Il ne faut pourtant pas multiplier sans discernement les courbes sur une même figure: la clarté est toujours la règle souveraine.

Cependant les compagnies de chemins de fer dressent des graphiques de la marche des trains où les lignes se croisent en grand nombre, mais qui n'en sont pas moins clairs, parce qu'ils montrent

d'un coup d'œil, par leur croisement même, en quel lieu et à quelle heure les trains se rencontrent.

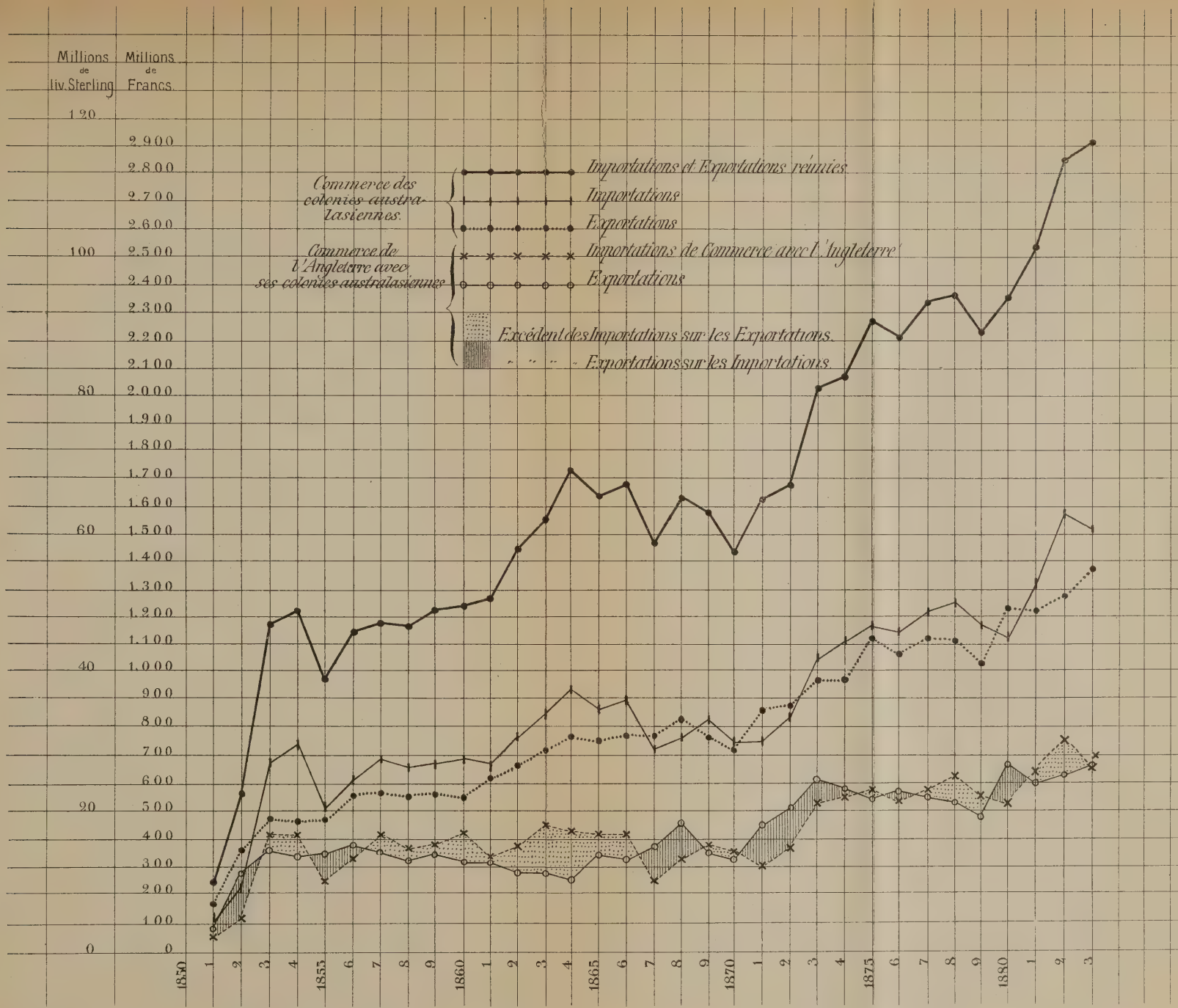
Voici, comme exemple de l'emploi de plusieurs courbes, une figure du commerce des Colonies britanniques de l'Australasie, sur laquelle nous avons pu associer cinq faits sans confusion et avec profit. (Voir la figure ci-jointe, fig. G, "Commerce total des sept "colonies, importation et exportation, et commerce d'importation et "d'exportation avec l'Angleterre." Extrait de la Revue Coloniale internationale, numéro de Septembre.)

L'importation et l'exportation sont deux faits qui ont une étroite corrélation. L'enchevêtrement des deux courbes qui les représentent montre l'alternance de supériorité de l'une sur l'autre. On peut rendre plus sensible à l'œil la différence en remplissant l'intervalle entre les deux courbes par une couleur ou par une hachure, comme nous l'avons fait pour le commerce de l'Angleterre avec ses colonies d'Australasie; l'excès de l'une à l'égard de l'autre se mesure ainsi plus facilement à l'œil.

Voici un autre exemple où le nombre des courbes est de huit. (Voir la figure ci-jointe, fig. H, "Tables de survie de la France, etc.") C'est la réduction d'une figure murale dont nous nous servons dans notre enseignement pour faciliter la comparaison des principales tables de survie. L'axe des abscisses représente les âges; l'axe des ordonnées, le nombre des vivants. Ce nombre se trouvant diminué à chaque âge du nombre des decès de l'âge précédent, la courbe s'abaisse d'autant plus vite que la mortalité est plus grande. La figure montre combien cette mortalité était plus rapide autrefois (Halley, Dupré de St. Maur, Duvillard) qu'aujourd'hui dans la masse de la population, surtout durant l'enfance; combien la vitalité se ressemble en France et en Angleterre, comment elle est plus solide en Suède et surtout en Norvège qu'en France, plus pour les têtes choisies (Deparcieux) que pour l'ensemble d'une population: notions diverses qui apparaissent tout d'abord à l'œil d'une manière saisissante sur la figure, et qu'il faudrait chercher longuement dans des tables.

En employant des couleurs diverses, on peut multiplier le nombre des courbes et même tracer sans confusion des courbes qui s'enchevêtrent. En voici un exemple tiré du mémoire, "Elec-"toral Statistics," de M. J. Biddulph Martin, qui a été lu devant la Société de Statistique en février 1884. L'auteur se proposait de mettre en parallèle, d'une part, l'accroissement de la population rurale et de la population urbaine de l'Angleterre (avec le Pays de Galles), d'autre part, celui du nombre des électeurs de l'une et de l'autre catégorie. Au début, en 1831, 62·5 pour cent de la population totale appartenaient à la première catégorie et 37·5 à la seconde; sur 100 électeurs inscrits, il y en avait 56·8 de la première et 43·2

G



Figure, G. Commerce total des sept colonies (importation et exportation) et commerce d'importation et d'exportation avec l'Angleterre.
(Extrait de la **REVUE COLONIALE INTERNATIONALE**)

Fig. H.

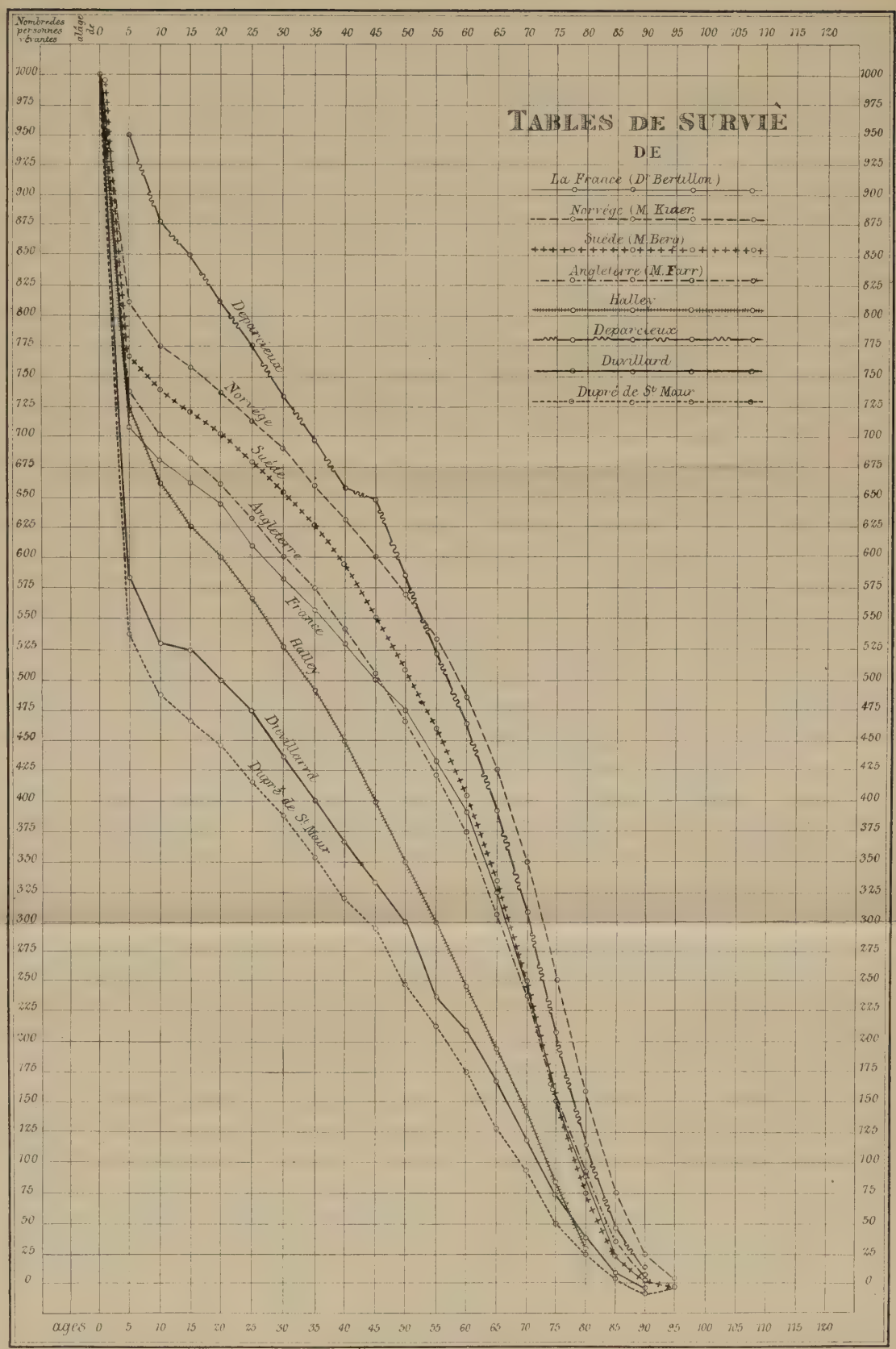


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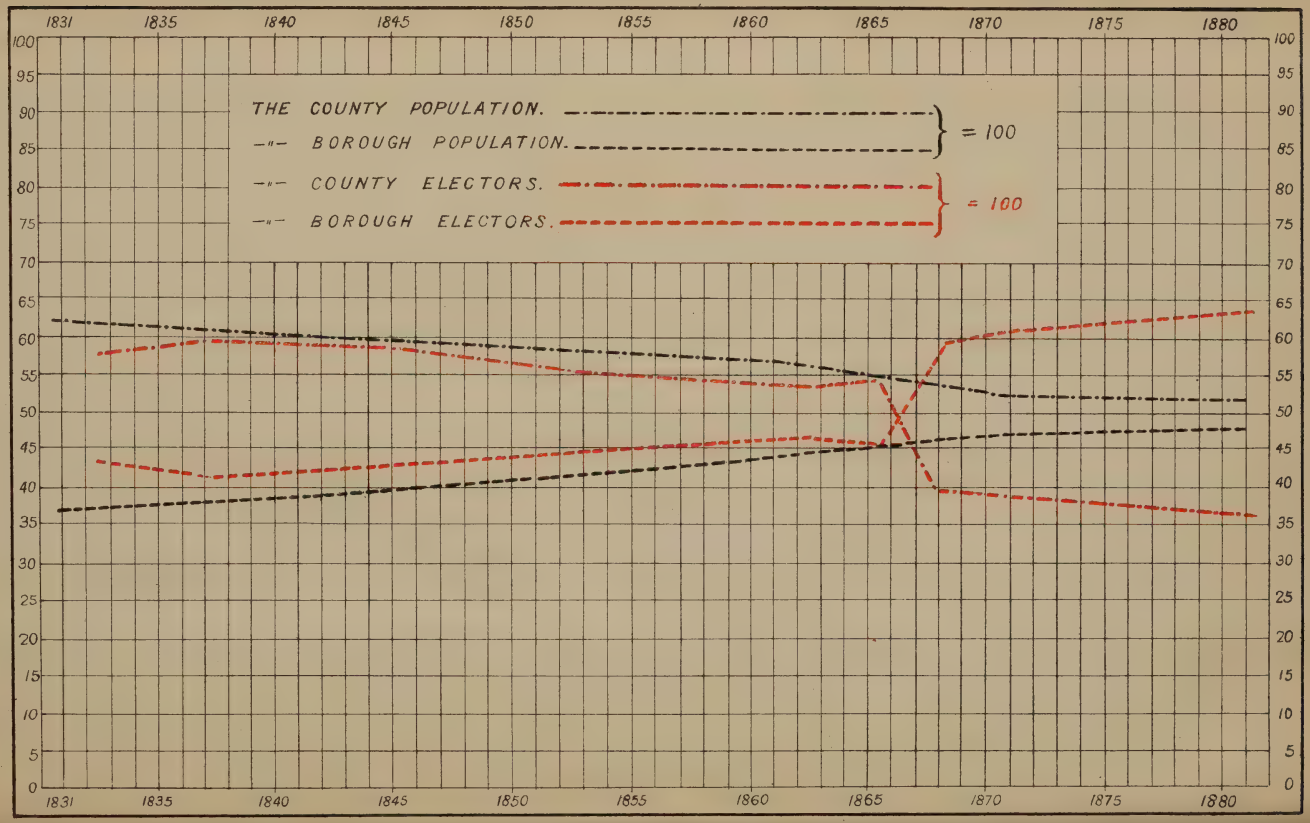
Fig. J.

DIAGRAM SHOWING THE PERCENTAGE FROM 1831 TO 1881 OF



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de la seconde. De 1831 à 1881, la population a augmenté de 86·8 pour cent et le nombre des électeurs a presque quadruplé ; mais, à cette dernière date, la population urbaine égale presque la population rurale, et le nombre des électeurs urbains dépasse de plus des deux tiers le nombre des électeurs ruraux. Ces rapports, quoique complexes, et l'influence que la loi de 1867 a exercée sur leur changement apparaissent avec clarté sur la figure, grâce à l'emploi de deux couleurs (voir la figure ci-jointe, fig. J).

Dans le diagramme rectangulaire, l'axe des abscisses est une ligne droite sur laquelle les ordonnées s'élèvent, espacées comme le sont les phénomènes dans le temps. On peut construire un diagramme par un procédé différent, en faisant partir toutes les coordonnées d'un centre comme autant de rayons : on obtient le DIAGRAMME POLAIRE. Ces coordonnées rayonnantes ont d'ailleurs, comme dans le diagramme rectangulaire, une longueur proportionnelle à l'importance des faits qu'elles représentent. Les espaces qui les séparent ne sont pas non plus arbitraires dans ce genre de figure : ils sont mesurés par des angles, au lieu de l'être par des lignes droites.

Les diagrammes polaires ont une certaine élégance qui les fait adopter de préférence par quelques statisticiens. Ils ont l'avantage de ramasser dans un petit espace un certain nombre de faits, et de bien marquer la continuité du phénomène de la fin d'une période au commencement de la période suivante, décembre, par exemple, se trouvant, dans un diagramme polaire des douze mois de l'année, contigu à janvier. Aussi les emploie-t-on souvent pour représenter des phénomènes qui se produisent aux diverses époques de l'année. Voici, comme spécimen, un diagramme dressé par M. Janssens, chef de la Statistique municipale de Bruxelles, qui figure la mortalité moyenne par mois (période 1870-84) des enfants de 0 à 1 an et celle des enfants de moins de 1 mois à Bruxelles. (Voir la fig. K, " Mortalité des enfants de moins d'un mois et des enfants " de 0 à 1 an à Bruxelles.") Pour faciliter l'intelligence de la figure, l'auteur a tracé le cercle de la mortalité moyenne pour l'année entière, et, d'après un procédé que nous avons déjà signalé en parlant des diagrammes (importation et exportation de l'Angleterre en Australasie), il a marqué par des teintes différentes les mois où la mortalité dépasse la circonférence, c'est-à-dire où elle est au-dessus de la moyenne, et ceux où elle reste en deçà, c'est-à-dire où elle est au-dessous de la moyenne. L'influence néfaste de l'été sur la vie des petits enfants s'y montre d'une manière très apparente. La mortalité des enfants de moins d'un mois, représentée par le petit cercle intérieur, a deux maximum, l'un en été et l'autre en janvier.

FIG. K. Mortalité des enfants de moins d'un mois et des enfants de 0 à 1 an à Bruxelles, par M. Janssens.

Le diagramme polaire est d'un excellent usage pour représenter la direction et l'intensité des vents dans une localité ; M. Lalanne en a donné le premier exemple dans l'appendice de la traduction de la météorologie de Kaemtz, en 1843. Un tableau du nombre des jours où le vent a soufflé S.E., N.E., etc., est d'une lecture difficile, tandis qu'une figure, telle que la suivante (voir la Fig. L), parle d'elle-même et accuse tout d'abord la prédominance des vents d'ouest. Sur une carte météorologique que nous ne pouvons reproduire ici, et sur laquelle nous avons représenté de cette manière la rose des vents dominants par départements, on remarque du premier coup d'œil la prédominance des vents d'ouest dans la por-

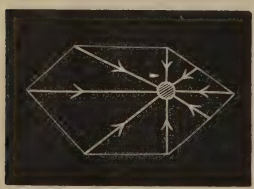


FIG. L. Direction des vents.

tion occidentale de la France, et celle des vents du sud et du nord dans le bassin du Rhône.

Notons, en passant, le diagramme de l'indicateur de Watt, dans lequel l'abscisse marque la course du piston, l'ordonnée la pression de la vapeur et où la surface enveloppée mesure le travail : ce genre de diagramme relève de la mécanique plutôt que de la statistique.

Le diagramme, surtout le diagramme rectangulaire, est de beaucoup la figure de statistique la plus usitée. Descartes, en fondant la géométrie analytique, a donné la loi de ce genre de représentation d'une série de nombres et il l'a lui-même employé, ainsi qu'il le dit dans le "Discours sur la Méthode." C'est un écrivain Anglais, W. Playfair, qui paraît en avoir fait le premier une application aux études économiques dans ses "Tableaux "d'arithmétique linéaire du commerce, des finances, et de la "dette nationale d'Angleterre," publiés en 1789. Nous n'insistons pas, parce que nous voulons faire un exposé sommaire et non une histoire des procédés graphiques appliqués à la statistique ; nous nous bornons donc à renvoyer pour plus de détails aux ouvrages les plus autorisés sur la matière, en premier lieu à "La Méthode "graphique dans les sciences expérimentales et principalement "en physiologie et en médecine" (1879), par M. Marey, membre de l'Institut ; en second lieu, au mémoire de M. G. Mayr intitulé, "Gutachten über die Anwendung der graphischen und geographis-"chen Methode in der Statistik" (1874), et au "Rapport de "M. Cheysson sur les méthodes de statistique graphique à l'expo-"sition de 1878."

Quand on examine, comme l'a fait M. Marey, qui a donné à la fois le précepte dans son livre et l'exemple dans ses beaux travaux de physiologie, l'emploi des graphiques non seulement dans la statistique, mais dans les sciences de la nature, on trouve des cas où le diagramme est non pas la traduction des nombres en figure, mais la seule expression possible des phénomènes ; tel est, par exemple, le cas de battements du pouls et de l'enregistrement de la température. L'auteur qui ferait une étude complète des graphiques devrait distinguer nettement les graphiques statistiques, qui sont la traduction par des figures de nombres déjà connus, et les graphiques enregistreurs employés dans les sciences naturelles, surtout en physiologie, qui inscrivent automatiquement des phénomènes souvent impossibles à percevoir directement par l'œil. Les uns et les autres représentent des faits sous forme de figures ; mais les derniers sont, comme le microscope, des moyens d'investigation que rien ne pourrait remplacer et se classent, par conséquent, parmi les procédés d'invention.

Dans la salle des séances du congrès de statistique de Londres, on remarquait la collection des diagrammes muraux de M. Price Williams qui représentaient le taux d'accroissement de la population

de chaque quartier de Londres depuis le commencement du siècle et qui montraient d'une manière très expressive l'état stationnaire et même la diminution des quartiers de la cité, à côté du rapide développement de la partie occidentale. La semaine précédente, les murs de la salle du congrès de statistique de Paris étaient garnis de diagrammes, relatifs pour la plupart à la démographie, parmi lesquels figuraient ceux de M. Loua, ceux de M. Bertillon fils, ceux de M. R. Lafabrègue, particulièrement distingués par l'élégance de l'exécution. C'est à l'aide d'un diagramme de ce genre, qui me sert pour mon enseignement, que j'ai retracé, dans une séance du congrès, l'histoire de la natalité française.

II.—*Les Cartes.*

Si la courbe est employée le plus souvent pour représenter la relation d'un fait statistique avec le temps, la carte de statistique l'est toujours pour en marquer la relation avec l'espace. Je m'explique. De même qu'une série de lignes régulièrement espacées et figurant par leur hauteur l'intensité du phénomène à chaque époque fait d'un coup d'œil voir, ainsi que nous l'avons dit, les variations de ce phénomène dans la suite des temps ou ses relations avec un autre phénomène, de même la juxtaposition sur une carte de signes représentant un fait statistique et disposés conformément à certaines divisions territoriales montre d'un coup d'œil la relation de ce fait avec le territoire. Le premier est un tableau synoptique de la chronologie des phénomènes ; le second, de leur topographie.

Il est aisé de comprendre l'intérêt de ce dernier genre de figure. Aussi les CARTES DE STATISTIQUE ou *cartogrammes*, comme on les désigne par une expression plus technique, occupent-elles une place importante dans la statistique figurée.

Nous les classons en quatre espèces principales : les *cartes avec diagrammes*, les *cartes teintées par divisions territoriales*, les *cartes avec courbes*, les *cartes en relief*.

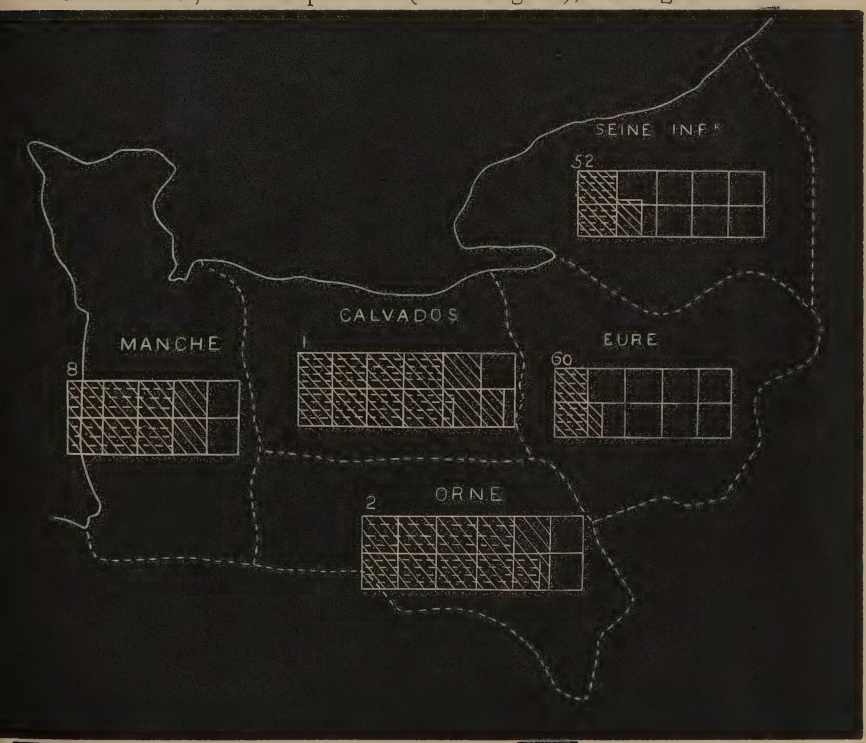
I. On peut, sur une carte ordinaire, appliquer la plupart des figures dont nous avons déjà parlé, telles que lignes, surfaces, diagrammes polaires ou autres. Leur position dans chaque circonscription ou dans chaque localité où le phénomène est représenté suffit pour marquer leur relation topographique.

Voici quelques exemples de l'emploi de ce procédé qui constitue la CARTE AVEC DIAGRAMMES.

Une carte d'Europe sur laquelle la longueur des chemins de fer de chaque État, représentée par une ligne horizontale, est tracée sur l'emplacement de chaque État, débordant même, s'il le faut, hors de ses limites, donne une idée de la répartition topographique des voies ferrées et de leur importance relativement au territoire de ces États. En même temps, un cercle ou un carré peut figurer soit le prix moyen du kilomètre carré, soit le nombre d'habitants par

kilomètre carré de chemin de fer, et rendre la carte plus instructive. Sur une telle carte il y a combinaison de la ligne et de la surface. Dans le dernier Album graphique du ministère des travaux publics, M. Cheysson a dressé une carte de ce genre pour représenter l'accroissement ou la diminution de la population dans chaque département et à chacun des quartorze recensements ; il l'a fait à l'aide de cercles divisés en quartorze secteurs et placés sur le territoire du département et il a réussi à donner une image claire d'un phénomène très complexe.

C'est par le procédé des surfaces qu'ont été dressées les quatre-vingt-deux cartes de l'Atlas statistique du ministère des finances représentant les résultats de la nouvelle évaluation du revenu foncier des propriétés non baties en France. Dans chaque département est inscrit un rectangle divisé généralement en dix parties égales, dont la surface totale marque la plus grande intensité du phénomène ; dans chaque rectangle la partie coloriée indique l'intensité particulière de ce phénomène dans le département en 1879, et la partie ombrée l'intensité à une époque antérieure. Nous insérons ici, comme spécimen (voir la fig. M), un fragment de la



Étendue en prairies à l'époque du cadastre. Étendue en prairies en 1879.

FIG. M. L'étendue des prairies en Normandie, à deux époques.

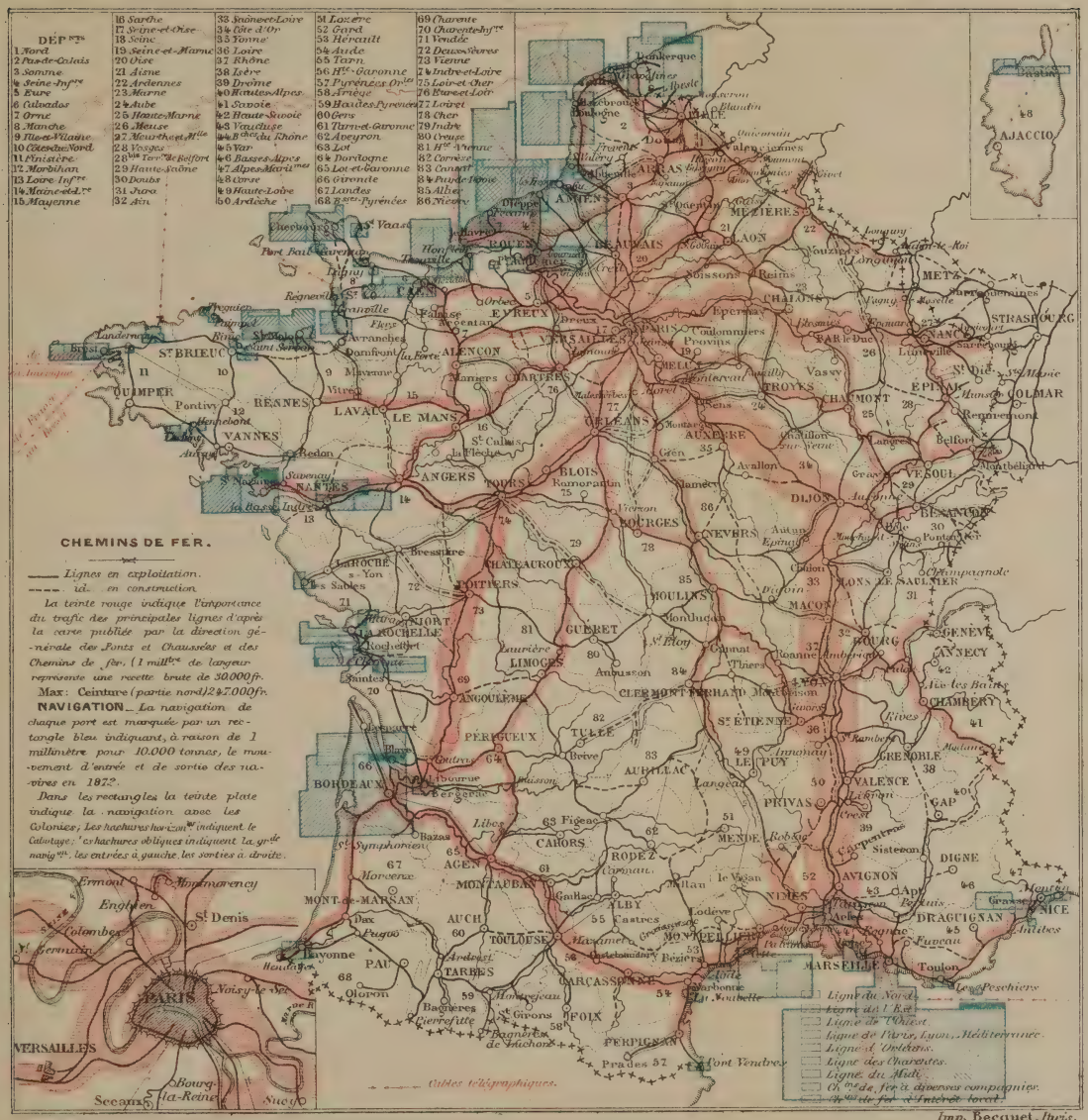
carte No. 4, "Contenance imposable des près et herbages," qui montre clairement la division de la Normandie en deux régions, celle des terres de labour (Seine-Inférieure et Eure), et celle des herbages, et l'accroissement des prairies dans cette dernière région depuis le cadastre.*

M. Cheysson, lorsqu'il était directeur de la Statistique graphique au Ministère des Travaux publics, a créé une intéressante publication, "l'Album graphique," dont l'objet principal était de vulgariser par des figures et surtout par des cartes la statistique des voies de communication et des transports. Il y a employé fréquemment les *cartogrammes à bandes*, qui conviennent particulièrement aux voies de communication et dont avaient fait usage avant lui, en France, un autre ingénieur, M. Minard, et, en Belgique, M. Belpaire. Les bandes suivent la direction des voies de communication et ont une largeur proportionnelle à l'importance du fait (nombre de voyageurs, recette kilométrique, etc.), qui est représenté par chaque bande ou par chaque section de bande. M. Cheysson les a ingénieusement comparées à des fleuves qui roulent, non des mètres cubes d'eau, mais des tonnes de marchandises et dont le lit s'élargit à mesure qu'augmente le débit. Une même bande peut se composer de plusieurs bandes parallèles, comme un total se compose de plusieurs éléments : par exemple, dans le tonnage transporté, on peut distinguer les vins, les matières premières, les produits manufacturés, etc.

Les bandes peuvent se combiner avec d'autres figures : par exemple, avec des cercles, figurant l'importance du trafic des gares. Il y a longtemps qu'on a représenté ainsi, d'une manière ingénieuse, l'importance de la production du charbon de terre dans chaque bassin et celle de l'importation de chaque pays étranger en France, figurées par des cercles ou par des carrés, et, en même temps, le transport de ces houilles jusqu'aux lieux de consommation par des lignes de largeur proportionnelle aux quantités. On voit d'un coup d'œil sur une carte de ce genre tout le mouvement commercial du charbon de terre en France, la convergence des houilles du bassin du nord, de la Belgique et de l'Angleterre vers Paris, le rayon d'approvisionnement de chaque bassin ou de chaque pays importateur, la manière dont ils se limitent ou se pénètrent les uns les autres.

Sur la carte ci-jointe, extraite de notre atlas (voir la fig. N), nous avons reproduit une carte extraite des publications du ministère des Travaux publics, qui figurait le trafic des chemins de fer par des bandes d'une largeur proportionnelle à la recette

* Chaque carré représente 15,000 hectares, soit 150,000 pour les 10 carrés du rectangle. Nous avons dû, sur cette figure, remplacer le coloris par des hachures ; néanmoins la figure reste claire.



Imp. Becquet. Paris.

Fig. N. TRAFIC DES CHEMINS DE FER
ET MOUVEMENT DE LA NAVIGATION DES PORTS EN FRANCE

brute kilométrique de la ligne; nous y avons ajouté, à l'aide de rectangles, le mouvement de la navigation des principaux ports en distinguant l'entrée, la sortie et la navigation avec les colonies pour l'année 1872.

II. La statistique officielle publie un grand nombre de renseignements, dont le total général pour un État se compose de totaux partiels correspondant aux divisions administratives de cet État. En France, le département est la division la plus importante; c'est celle qui à servi de cadre aux tableaux de l'Annuaire statistique de la France, que publie le ministère du Commerce. L'arrondissement, le canton, la commune fournissent des divisions de moindre étendue.

Veut-on représenter ces renseignements sur une carte par des teintes ou des hachures? On dresse une CARTE TEINTÉE PAR DIVISIONS TERRITORIALES. Dans le diagramme on figure chaque fait par une dimension exactement proportionnelle à son importance. Mais on ne saurait avoir autant de couleurs ou d'espèces de hachures qu'il y a de degrés d'intensité du fait; il est donc nécessaire d'établir des catégories. C'est à l'auteur qu'il appartient de voir, suivant le sujet qu'il traite et le nombre de teintes dont le mode d'impression lui permet de disposer, en combien de catégories il convient de distribuer la série des éléments qu'il doit représenter.

Une autre question à trancher est celle de la couleur. Quand la figure est imprimée en typographie dans un livre, cette question est décidée d'avance; *l'impression* vient *en noir*, et les catégories ne se distinguent que par le genre et l'intensité des hachures; on peut, dans ce cas, adopter soit des points de plus en plus rapprochés, soit des lignes de plus en plus épaisses ou de plus en plus serrées, soit des lignes croisées. M. Bertillon père avait dressé les cartes de sa " Démographie figurée " en établissant neuf catégories d'après ce procédé qui a l'avantage d'être moins coûteux que l'impression en couleur.

Beaucoup de statisticiens, lorsqu'ils emploient la couleur, n'en admettent qu'une seule pour représenter sur une carte un même ordre de faits; c'est le *système monochrome*, auquel se rattachent les cartes avec hachures imprimées en noir. Puisqu'il s'agit, disent-ils, d'un seul ordre de faits variant d'un lieu à un autre, non en genre, mais en intensité, il convient de les figurer par des teintes graduées d'une même couleur: c'est d'après le système que sont coloriées les petites cartes, très claires, qui accompagnent l'Annuaire statistique de l'Empire allemand. Nous signalons, comme spécimen, une des cartes qui accompagnent l'Annuaire de 1884; elle figure le rapport de la population industrielle à la population totale. Ne pouvant reproduire ici cette carte, nous renvoyons le lecteur à l'Annuaire; il y verra que les hachures, qui renforcent les teintes,

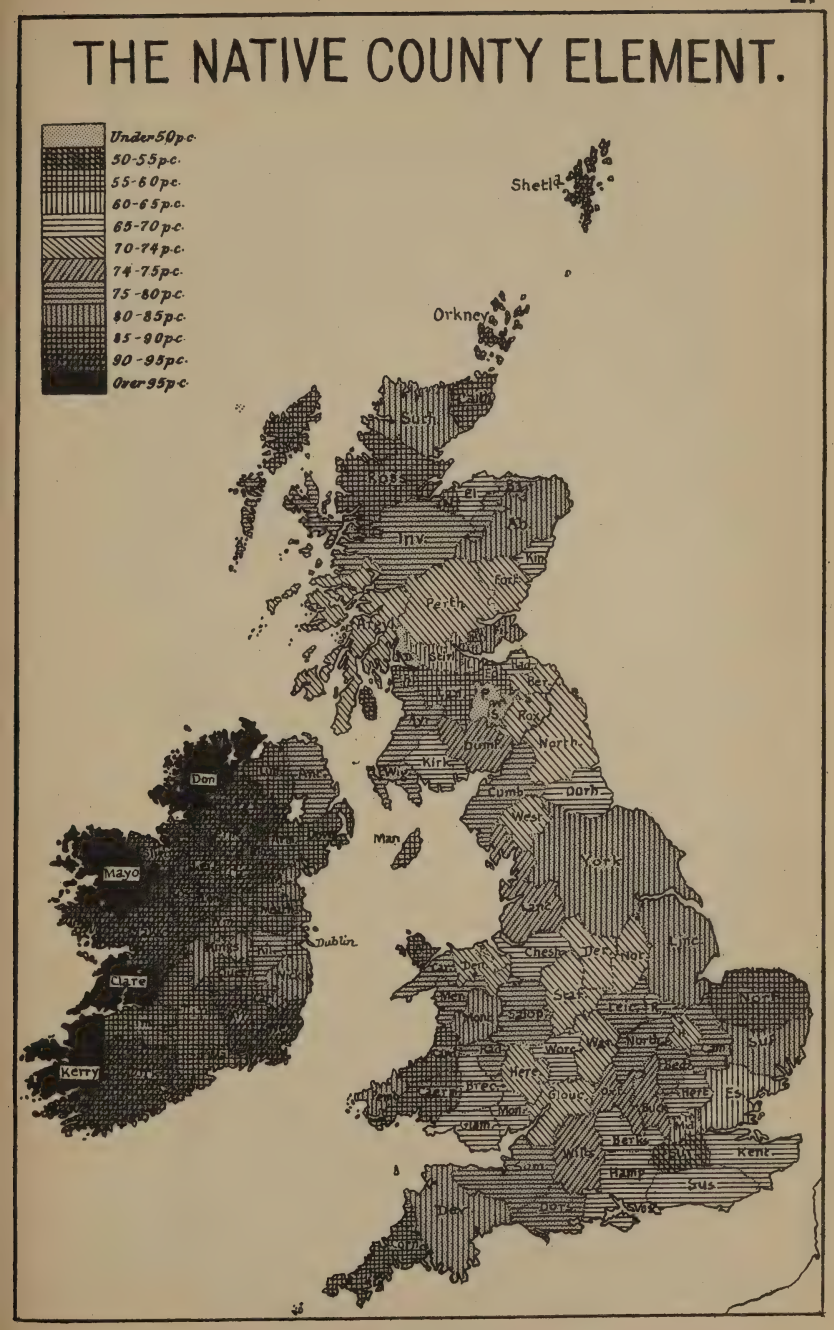
ont permis de distinguer neuf nuances; que les grands groupes manufacturiers de la Saxe (royaume, duchés et province), de la Lusace et de la Haute-Silésie, du bassin de la Ruhr et des provinces rhénanes de l'Alsace et de la Forêt Novie se détachent nettement par leur teinte sombre et que l'œil distingue aisément tous les groupes secondaires.

Ce système, qui est bon, n'a qu'un tort, que lui prêtent gratuitement quelques-uns de ses partisans : c'est de prétendre s'imposer, au nom de la logique, à l'exclusion de tout autre. Tous les systèmes qui peuvent traduire d'une manière claire une pensée utile sont également bons.

Nous en employons souvent un autre, qui consiste dans l'emploi de deux couleurs, *le rouge et le bleu.* Le rouge est appliqué à toutes les divisions territoriales où le fait s'élève au-dessus de la moyenne générale de l'État; le bleu, à toutes les divisions territoriales qui sont au-dessous de la moyenne; les teintes de rouge et de bleu sont, d'après un système uniforme, d'autant plus foncées que l'intensité du fait qu'elles représentent est plus grande. Ce système, qui est relativement peu coûteux puisqu'il n'exige que trois couleurs (noir pour le fond de la carte, rouge et bleu pour les teintes), a, en outre, un double avantage. En premier lieu, il est commode pour l'enseignement, parce qu'il présente tout d'abord aux yeux une idée très simple en divisant le pays, relativement au phénomène représenté, en deux catégories de régions, la catégorie pauvre et la catégorie riche; c'est une notion facile à retenir, que le système monochrome ne fournit pas avec la même netteté. En second lieu, il permet d'apercevoir, par un examen plus attentif, un plus grand nombre de catégories que le système monochrome, puisque la série des nuances s'applique à deux couleurs au lieu d'une. Voici, comme exemple (voir la figure ci-jointe, fig. O), une carte de la taille des conscrits en France dressée d'après les recherches du docteur Boudin sur le recrutement de 1850 à 1859 et extraite d'une des planches de notre atlas.

Nous emprunterions volontiers un second exemple de l'emploi des deux couleurs aux cartes qui accompagnent l'article de M. Ravenstein, "On the Laws of Migration," inséré dans le numéro de juin, 1885, du "Journal de la Société de statistique de "Londres." Quoique nous ne puissions l'insérer dans notre texte qu'en noir, en figurant par des lignes doublées de points ou par du noir absolu les parties qui sont en rouge sur l'original, nous donnons une de ces cartes (voir la fig. P); elle représente la proportion pour chaque comté des individus appartenant à la population rurale qui se sont trouvés, au recensement de 1881, dans le comté même où ils étaient nés. L'auteur a fait douze catégories, de 50 à 95 pour cent, six de rouge pour les comtés qui avaient plus de 74·60 pour

THE NATIVE COUNTY ELEMENT.



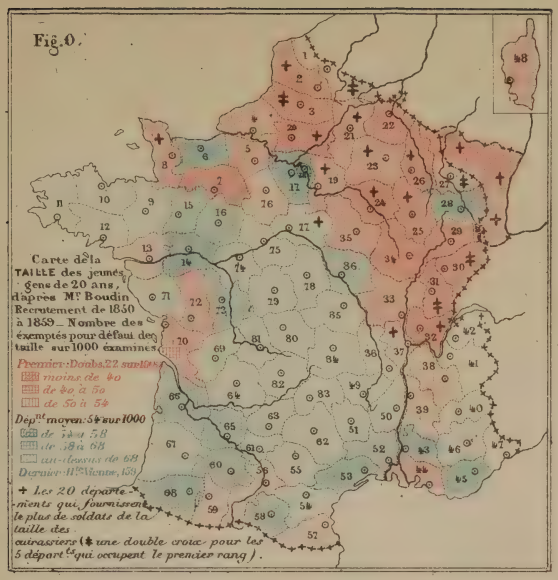


Fig. O. TAILLE DES CONSCRITS

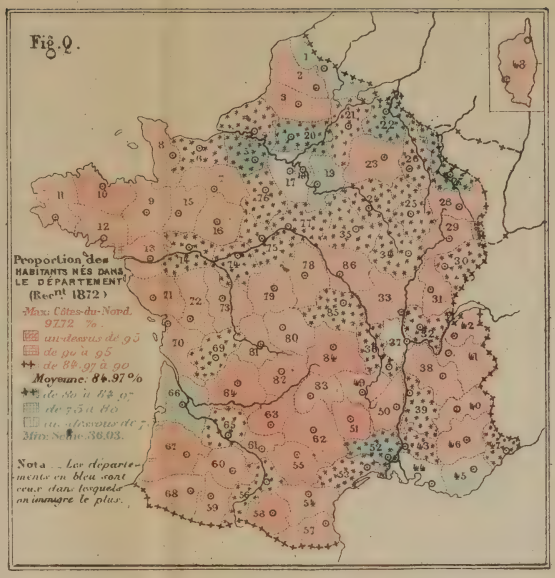


Fig. Q. HABITANTS NÉS DANS LE DÉPARTEMENT

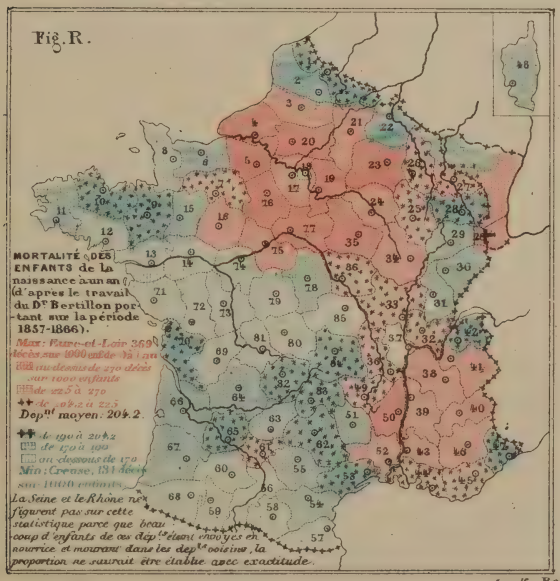


Fig. R. MORTALITÉ DES ENFANTS.

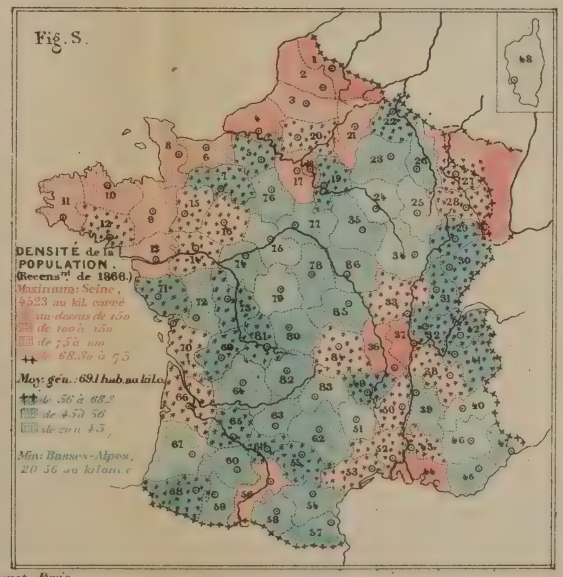


Fig. S. DENSITÉ DE LA POPULATION en 1866.

Imp.ie Becquet. Paris.

cent, moyenne générale du Royaume-Uni, et six de bleu pour les comtés qui avaient moins. Par un procédé inverse du notre, il a réservé les teintes bleues les plus claires aux circonscriptions qui se rapprochent le plus de la moyenne et les plus foncées à celles qui s'en éloignent le plus. Il fait comprendre ainsi comment se groupent les populations stables et les populations mobiles et laisse deviner les rapports qui existent entre cette mobilité et la nature du sol ou la condition économique des habitants. On immigre peu en Irlande, surtout dans les comtés de l'occident, peu dans les Highlands, peu dans la région montagneuse de l'Angleterre, Cumberland Pays de Galles occidental, Cornouailles, peu dans la plaine agricole de l'est. Il faut lire le mémoire de M. Ravenstein si l'on veut bien comprendre pourquoi beaucoup de natifs émigrent de ces régions qui ont peu d'industrie et trop peu de travail à offrir pour attirer ou même pour retenir les salariés, pourquoi on immigre, au contraire, beaucoup dans les régions manufacturières et commerciales de Glasgow et d'Edimbourg, du Northumberland et du Durham, du Staffordshire, du Monmouth et de Londres, et comment, par suite, les individus nés dans le comté y sont en proportion relativement moindre qu'ailleurs. Mais il suffit de regarder la carte pour avoir une idée très nette du phénomène.

Nous avons dressé, à la suite du recensement de 1872, une carte du même genre pour la France. Nous la donnons ici (voir la figure ci-jointe, fig. Q) comme terme de comparaison. Les mêmes influences se font sentir dans les deux pays. En France, ce sont les départements montagneux ou pauvres du Massif central, des Pyrenées, de la Vendée, de la Bretagne et des Alpes qui ont le plus d'habitants nés dans le département, parce que l'immigration ne s'y porte pas, tandis qu'elle est puissamment attirée dans le nord et vers les grandes villes, comme Paris, Lyon, Bordeaux, Marseille.

M. Cheysson, dans son rapport sur la statistique graphique à l'exposition de 1878, a fait à notre système une critique judicieuse, à savoir que les régions territoriales, qui sont, en realité, à peu de distance au-dessus ou au-dessous de la moyenne, paraissent ainsi séparées d'une manière trop absolue, tandis qu'il serait intéressant de connaître, ét, pour cela, de grouper ensemble les régions voisines de cette moyenne. Il a proposé soit d'ajouter une troisième couleur pour la zone moyenne, soit de laisser cette zone en blanc, et il a fait lui-même un emploi fréquent de ce procédé dans les cartes qu'il a publiées. Nous hésitons, pour notre part, à l'adopter, parce que nous craignons que la troisième couleur n'augmente le prix de l'impression, et que la troisième zone, qu'elle soit en couleur ou en blanc, ne nuise à la simplicité des notions qui conviennent à l'enseignement. Nous préférons marquer de croix ou de points, par l'impression en noir, la catégorie la moins intense

du rouge et la catégorie la plus intense du bleu, et les réunir ainsi par ce signe commun qui en fait une zone moyenne, sans cependant altérer la notion si simple de la région où il y a peu et de la région où il y a beaucoup. Voici, comme exemple de notre procédé modifié, la carte de la mortalité des enfants de 0 à 1 an dressée par nous d'après le travail du docteur Bertillon (voir la figure ci-jointe, fig. R).

M. Loua, chef du bureau de la Statistique générale de France, a dressé des cartes à cinq couleurs, avec une couleur pour la catégorie moyenne, deux pour les catégories supérieures et deux pour les catégories inférieures. M. Loua ne forme pas ses catégories arbitrairement, et il a raison ; il les établit en calculant les tranches d'après des écarts égaux ; il constitue, par exemple, un groupe moyen de 10 pour cent. au-dessus et au-dessous de la moyenne, un groupe de 10 à 30 pour cent. au-dessus, et un groupe de 10 à 30 pour cent. au-dessous de la moyenne. Le procédé est recommandable, et donne des résultats très corrects, quoiqu'il ne se prête pas toujours suffisamment à la représentation de certains extrêmes qu'il peut être intéressant de mettre en évidence. Les catégories par *tranches d'écart égal* qu'il établit ainsi par le calcul s'appliquent d'ailleurs au procédé du rouge et du bleu, comme à celui des cinq couleurs.

Nous aurions pu dire plus tôt que les cartes teintées représentent aussi bien des nombres absolus que des rapports ; par exemple, combien de chevaux en France par département, ou combien de chevaux en moyenne par kilomètre carré dans chaque département. L'une et l'autre notion peut être utile à connaître. La seconde a assurément un caractère plus scientifique : elle indique bien mieux le véritable état de richesse d'un pays ; car il est évident que la circonscription qui aurait deux fois plus de chevaux et dix fois plus de territoire que l'autre, serait en realité la moins riche en chevaux : ce qu'indique le rapport du nombre de ces animaux par kilomètre carré. Aussi est-ce la seconde qui est presque toujours représentée sur les cartes de statistique. On peut d'ailleurs exprimer l'une et l'autre à la fois, soit en représentant l'une par la teinte générale de la circonscription, l'autre par un cartouche placé dans la circonscription et teinté d'une autre couleur, soit en représentant le rapport par un cercle d'une teinte vive et d'une surface proportionnelle à l'intensité du fait.

Un département français est un territoire d'une étendue assez considérable pour renfermer des parties de nature très diverse. Par exemple, le nord du département de l'Hérault, qui comprend une partie de la région aride des Causses, diffère entièrement de la fertile plaine du Languedoc qui occupe le sud. Il en résulte que la moyenne départementale, composée parfois d'éléments contraires qui se neutralisent, ne donne qu'une image très imparfaite de la

Imp. Becquet. Paris.

Fig. T. DENSITÉ DE LA POPULATION EN FRANCE PAR CANTONS

répartition géographique du phénomène. M. G. Mayr, lorsqu'il était directeur de la Statistique du royaume de Bavière, avait recommandé, afin d'éviter cet inconvénient, de substituer des régions naturelles aux divisions administratives. Mais il est très difficile, souvent impossible de calculer exactement l'intensité d'un phénomène dans une région naturelle sur laquelle l'administration ne fournit pas de données particulières de statistique, parce qu'elle ne correspond pas à ses cadres. Nous l'avons essayé, il y a quelques années, pour la culture de la vigne en France : le résultat que nous avons obtenu n'est qu'approximatif.

A mesure que l'on dresse la carte à l'aide de circonscriptions administratives de moindre étendue, on serre en quelque sorte de plus près la réalité et on approche davantage du résultat désirable. Voici trois cartes ou fragments de cartes qui montrent la différence des résultats obtenus et l'avantage des circonscriptions de petite étendue.

La première (voir la figure ci-jointe, fig. S) représente la densité de la population de la France par départements d'après le recensement de 1866.

Sur la seconde (voir la figure ci-jointe, fig. T), nous avons, à l'aide de documents inédits sur la superficie et la population qu'a bien voulu nous fournir la Statistique générale de France, dressé la carte de la densité de la population par cantons, peu de temps après le recensement de 1872. On voit, sur l'une et l'autre carte, que la région du nord et du nord-ouest, le bassin du Rhône, la vallée de la Garonne sont les parties les plus peuplées de notre territoire ; mais, sur la carte par cantons, on pénètre par le détail plus avant dans la réalité des faits. Les régions denses semblent se contracter et les groupes se condenser ; il se forme une sorte de cristallisation de la population autour de certains centres. C'est ainsi qu'en Bretagne on reconnait que la densité moyenne est le résultat de la vie côtière qui, par la pêche et la marine, offre aux habitants des ressources particulières, tandis que la partie centrale et montagneuse est médiocrement peuplée ; on aperçoit aussi l'influence des grandes villes, celle des bassins houillers, des vallées fertiles, des ports : notions intéressantes, qui ne se dégagent pas de la carte de la densité par départements. L'image est assurément plus expressive : on peut dire qu'elle habille mieux le sol.

La troisième est plus expressive encore ; c'est un fragment réduit de la carte à l'échelle $\frac{1}{320,000}$ de la densité de la population par communes, dressée par M. Turquan. Cette carte est un travail considérable et instructif, dont l'auteur a bien voulu faire la réduction pour une partie du bassin de la Garonne (voir la fig. U). On y voit, plus clairement encore que sur la carte par cantons, la population se cristalliser sur certains points. Les teintes de la

région dense dessinent ici avec une grande exactitude les contours de la vallée de la Garonne et d'une partie de la Gironde, celle du Lot et d'une partie de ses affluents ; le rapport entre la topographie, l'agriculture florissante dans les riches vallées et la population qui s'y presse apparaît là avec évidence.*

FIG. U. Répartition de la population en France par courbes de niveau statistiques (fragment).

Le baron Charles Dupin est le premier qui ait popularisé en France les cartes de statistique, en dressant, à l'époque de la Restauration, une carte de l'instruction primaire sur laquelle les départements étaient teintés d'un noir d'autant plus foncé qu'ils comptaient plus de conscrits ne sachant ni lire ni écrire. Après lui, M. de Guerry a dressé un atlas de la criminalité en France et en Angleterre, qui lui a valu le prix de statistique à l'Académie des sciences. Plus tard, à l'exposition du congrès de géographie de Paris en 1875, M. Heuzé exposait une collection très complète de cartes agricoles de la France, et nous produisions les premières planches de notre atlas relatives à la France économique, lesquelles contenaient une centaine de cartes statistiques sur la production agricole et industrielle, sur le commerce et la population. Aujourd'hui les cartes de statistique sont devenues d'un emploi fréquent en France dans beaucoup de travaux statistiques, tels que

* L'auteur a adopté le procédé du rouge et du bleu, en appliquant toutefois la teinte bleue la plus claire à la catégorie la plus voisine de la moyenne. Ne pouvant reproduire les couleurs dans le texte de ce mémoire, nous les remplaçons—très imparfaitement—par des hachures et des parties en blanc.

ceux du docteur Bertillon, du docteur Lunier, et dans beaucoup de publications officielles, parmi lesquelles nous citerons celles du ministère des Travaux publics, du ministère du Commerce, du ministère des Finances, du ministère de la Justice, du ministère de l'Intérieur, du ministère de l'Instruction publique.

Hors de France, nous citerons, entre autres travaux du même genre, les cartes publiées par la Statistique générale du royaume d'Italie, qui a pris dans le monde savant un rang si honorable depuis quelques années; par les bureaux de l'Empire allemand et de la Prusse, par ceux de l'Autriche, de la Belgique. Nous n'essayons pas de dresser une liste complète: il nous suffit de signaler la faveur dont jouit maintenant ce mode de représentation graphique.

III. Le fragment de carte de M. Turquan a un caractère particulier dont nous n'avons pas encore parlé. Comme l'auteur disposait d'un très grand nombre d'éléments (36,000 communes en nombre rond), il a pu, à l'aide de certaines interpolations légitimes, dresser non une carte par divisions territoriales, mais une carte avec courbes.

La CARTE DE STATISTIQUE AVEC COURBES est celle qui ne considère le fait statistique que dans sa relation avec le point du territoire sur lequel il s'est produit, sans se préoccuper d'aucune division territoriale.

Le géographe français Buache, dès 1737 et ensuite dans son "Essai de Géographie physique," publié en 1752, avant lui, des Hollandais dans leurs travaux hydrographiques avaient employé des courbes de niveau pour figurer les profondeurs de la mer ou l'altitude du sol. Le français Ducarla avait fait à ce sujet une communication à l'Académie des sciences en 1771.

En faisant passer par le terrain une suite de plans horizontaux, parallèles et équidistants, qui le coupent par étages, autrement dit par tranches d'égale hauteur, on obtient des courbes de niveau résultant de l'intersection de ces plans et de la surface du sol, et, par ces courbes, une figure précise des mouvements du terrain; c'est même la plus précise, souvent aussi la plus expressive que les topographes puissent employer pour dresser une carte. Mais, pour dresser une pareille carte, il faut qu'ils possédent un très grand nombre de cotes, c'est-à-dire de points d'une altitude connue, qui, en formant sur le sol un réseau serré, permettent de dessiner la ligne d'intersection à sa véritable place. L'intervalle d'une courbe à l'autre étant ensuite colorié d'une teinte particulière, on obtient une carte hypsométrique; les teintes peuvent être, comme sur les cartes de statistique par régions territoriales, de couleurs multiples ou de nuances graduées d'une même couleur.

Ce qu'on fait pour le relief du sol, on peut le faire pour repré-

senter sur une carte l'intensité d'un fait quelconque, puisqu'on peut supposer les faits empilés les uns au dessus des autres sur le terrain, à la place même où ils se sont produits, comme on le suppose pour les colonnes des diagrammes. La différence est que les colonnes du diagramme sont disposées à la file sur une ligne qui est l'axe des abscisses, tandis que celles de la carte sont distribuées sur un plan et qu'ainsi, au lieu de deux dimensions, longueur et hauteur, le géomètre doit calculer ses positions d'après trois données, longueur, largeur et hauteur.

M. Lalanne, qui avait fait déjà quelques applications du graphique à trois dimensions pour des travaux d'ingénieur, publia, à la suite de la traduction française de la météorologie de Kaemtz (1843), un appendice sur la représentation graphique des tableaux météorologiques et des lois naturelles en général, et donna, entre autres exemples, les courbes de la température de la ville de Halle pour chaque heure du jour et pour chaque mois de l'année. Ces courbes rappellent tout-à-fait celles d'une carte hypsométrique avec une crête, qui est la ligne de la température la plus élevée, en juillet, et sur cette crête un sommet vers trois heures de l'après midi, plus loin une vallée, c'est-à-dire une ligne de la plus basse température, en décembre. La même année, il faisait connaître sa méthode par une communication à l'Académie des sciences, et il en donnait diverses applications, notamment celle d'un abaque ou compteur universel. Cette méthode, qu'il était, sinon le premier à employer, du moins le premier à démontrer et à mettre en lumière, s'appliquait à la représentation de toute espèce de séries de faits déterminés par trois variables et, par conséquent, aux cartes dont les variables sont, d'une part, la longitude et la latitude, éléments topographiques, et, d'autre part, l'intensité du fait, élément statistique.

M. Vauthier, faisant de cette méthode une application que M. Lalanne avait spécialement signalée en 1848, a dressé, en 1874, une carte par courbes de la densité de la population à Paris : cette carte indiquait d'une manière expressive les deux centres de la plus grande densité, l'un, le plus important, sur la rive droite, traversé par la rue de Rambuteau, l'autre sur la rive gauche, traversé par la rue de la Harpe, et la densité décroissante du centre vers les extrémités de la ville. L'abondance des données statistiques autorise un pareil dessin pour la population de Paris, comme il l'autorise, à l'échelle de $\frac{1}{320000}$, pour la population de la France par communes.

Quand les documents sont suffisants, la carte avec courbes est assurément le mode qui représente le mieux le groupement naturel des faits. Mais il est rare qu'ils soient suffisants ; la plupart des éléments de la statistique officielle sont publiés par circonscriptions

d'une grande étendue, et, dans ce cas, la carte teintée par régions administratives, qui est la représentation exacte d'une donnée certaine, est préférable à une carte avec courbes qui ne serait construite qu'à force d'hypothèses. Ce n'est pas que nous proscrivions absolument ce genre d'hypothèse; nous en avons usé nous-même pour représenter, comme la publication allemande "Die "Bevölkerung der Erde," la densité de la population en Europe et en Amérique. C'est une question de mesure; nous croyons qu'on doit être en général très réservé dans l'emploi de ce procédé, et nous voulons mettre en garde contre l'illusion d'exactitude qu'il peut quelquefois produire.

IV. De la carte avec courbes à la CARTE EN RELIEF il n'y a, pour ainsi dire, que la distance de l'image à la réalité. Cependant l'image représente seulement un certain nombre de plans superposés, tandis que la carte en relief figure toutes les hauteurs, telles qu'elles existent.

On a dressé des cartes en relief de la densité de la population qui présentent à l'œil une opposition assez piquante avec le relief topographique; les parties en saillie sur le terrain sont d'ordinaire les parties basses sur ces cartes, et inversement, parce que la densité est presque toujours faible dans les montagnes, et que les vallées ont en général une population dense. Ce genre de représentation ne saurait toutefois, malgré l'avantage qu'il présente dans quelques cas, être très recommandé, parce que de telles cartes sont coûteuses à établir et encombrantes à transporter, sans être d'ordinaire plus instructives que la carte avec courbes.

On a même essayé de faire des reliefs par régions administratives, procédé qui nous parait devoir être condamné, parce qu'il n'ajoute rien à ce qu'exprime une carte par teintes régionales, et parce que les prismes qui figurent chaque région, ne se raccordant pas en hauteur, présentent par leurs côtés coupés à pic et leurs arêtes discordantes un aspect incohérent qui choque le regard et l'esprit. Si l'on essaie, comme on l'a proposé, de transformer ensuite une carte ainsi construite en carte avec courbes, et que, pour cela, on abatte les arêtes des prismes pour les réunir en pentes douces aux prismes voisins, on substitue une hypothèse sans fondement à une donnée numérique, et on s'expose à des erreurs. A quoi bon prendre un procédé plus coûteux que celui de la carte coloriée pour arriver à un résultat inférieur? On obtient, il est vrai, la carte topographique d'un relief en abattant les arêtes du relief par gradins pour les remplacer par des pentes continues, et on est pleinement autorisé à le faire, parce qu'il y a, en réalité, continuité des pentes et que les courbes permettent même, si elles sont assez serrées, de mesurer très exactement ces pentes. Mais, entre deux circonscriptions territoriales voisines qui n'ont ni le même sol, ni la

même densité de population, ni le même état économique, il y a juxtaposition, sans qu'il y ait nécessairement continuité de phénomènes. La comparaison d'une carte de la densité en France par départements sur laquelle on aurait opéré ainsi avec la carte de la densité dressée par M. Turquan montrerait d'une manière évidente le vice de ce procédé.

III.—*Les Solides.*

Les SOLIDES ou STÉRÉOGRAMMES sont la représentation en relief de faits statistiques. A ce titre, les cartes en relief pourraient figurer dans ce chapitre aussi bien que dans le précédent : cependant nous réservons le nom de STÉRÉOGRAMMES aux figures dans lesquelles l'espace n'est pas une des variables. M. Lalanne, dans son mémoire de 1843, avait donné la théorie de ce mode de représentation. Des savants de plusieurs pays, M. Berg en Suède, MM. Knapp, Lexis, Becker en Allemagne ont traité la même question théorique ou donné des exemples de diagrammes à trois coordonnées. Le directeur de la Statistique générale du royaume d'Italie a fait construire, par les soins de M. Perozzo, des stéréogrammes de ce genre. Ce sont des documents utiles dans un cours de démographie ; j'en ai fait plusieurs fois usage.

Avec un diagramme ordinaire, qui est un plan sur lequel on dispose de deux coordonnées, on marque la relation de deux faits, par exemple, celle du temps et du nombre annuel des naissances, et on dresse ainsi la courbe de la natalité. Comme avec un solide on dispose d'une troisième dimension et, par conséquent, d'une troisième coordonnée, on peut figurer l'âge des personnes vivantes en même temps que le nombre des vivants et le temps auquel se rapporte l'observation. La population de la Suède, dont les recensements remontent à l'année 1750, fournissait la matière d'un stéréogramme particulièrement intéressant pour la démographie : c'est le premier exemple que M. Perozzo a mis en relief, en utilisant une figure géométrique dressée par M. Berg. Sur le stéréogramme qu'il a construit et dont nous ne pouvons réproduire ici que la projection géométrique (voir la figure ci-jointe, fig. V, "Incolarum descriptio, " mares qui vivi nati sunt et superstites per ætates descripti juxta " census in Suecia habitos ab anno MDCCL ad MDCCLXXV." Extrait de la notice sur le stéréogramme de la population de la Suède publié par la Direction de la Statistique du royaume d'Italie), on lit très distinctement, de gauche à droite, non seulement l'accroissement de la population résultant de l'accroisement des naissances annuelles, que figurerait aussi bien un diagramme ordinaire, mais l'accroissement à tous les âges, et, en outre, en suivant les lignes (lignes rouges sur la figure), du fond en avant, la composition par âges de la population à chaque recensement et, en suivant oblique-

PROBABILITÀ DI MARITARSI
ENTRO UN ANNO
SECONDO LE VARIE COMBINAZIONI DI ETÀ DEGLI SPOSI E DELLE SPOSE

Osservazioni del biennio 1878-79 Rapporti perequati a 10.000 celibi o vedovi e rispettivamente a 100 000 nubili o vedove delle singole età

PROBABILITÀ CHE UN UOMO DI UNA DETERMINATA ETÀ HA DI AMMOGLIARSI CON DONNE DEI VARII GRADI DI ETÀ

PROBABILITÀ CHE UNA DONNA DI UNA DETERMINATA ETÀ HA DI MARITARSI CON UOMINI DEI VARII GRADI DI ETÀ

COMBINAZIONI DELLE ETÀ DEI CONIUGI ALLE QUALI CORRISPONDE UNA MEDESIMA PROBABILITÀ DI MATRIMONIO

SCALE DELLO STEREOGRAMMA

1.cm PER OGNI ANNO DI ETÀ 2.cm PER 15 MATRIMONI

SISTEMA DEGLI ASSI

Fig. 1.a

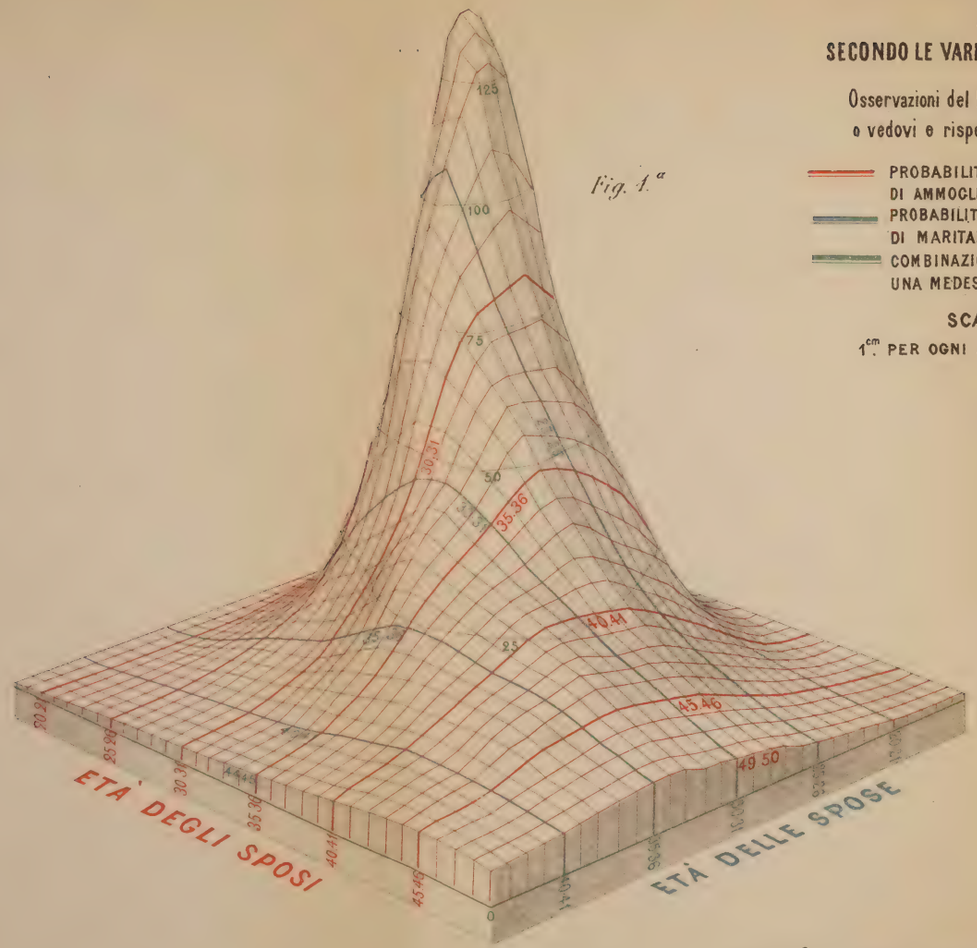
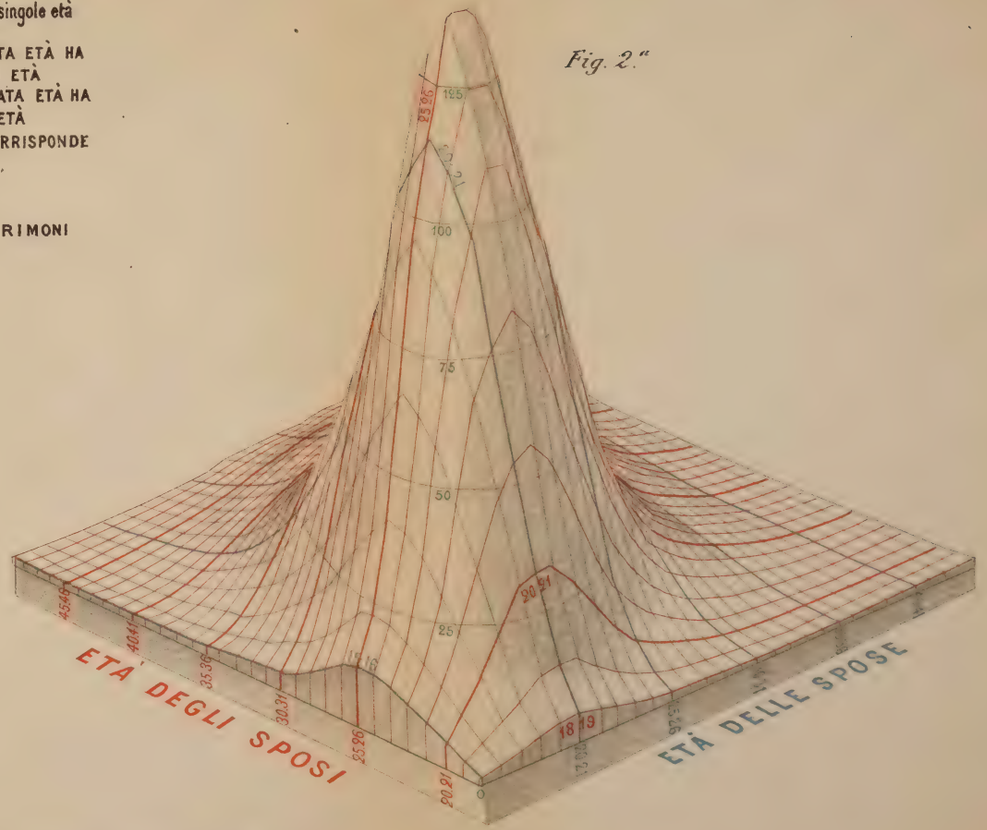
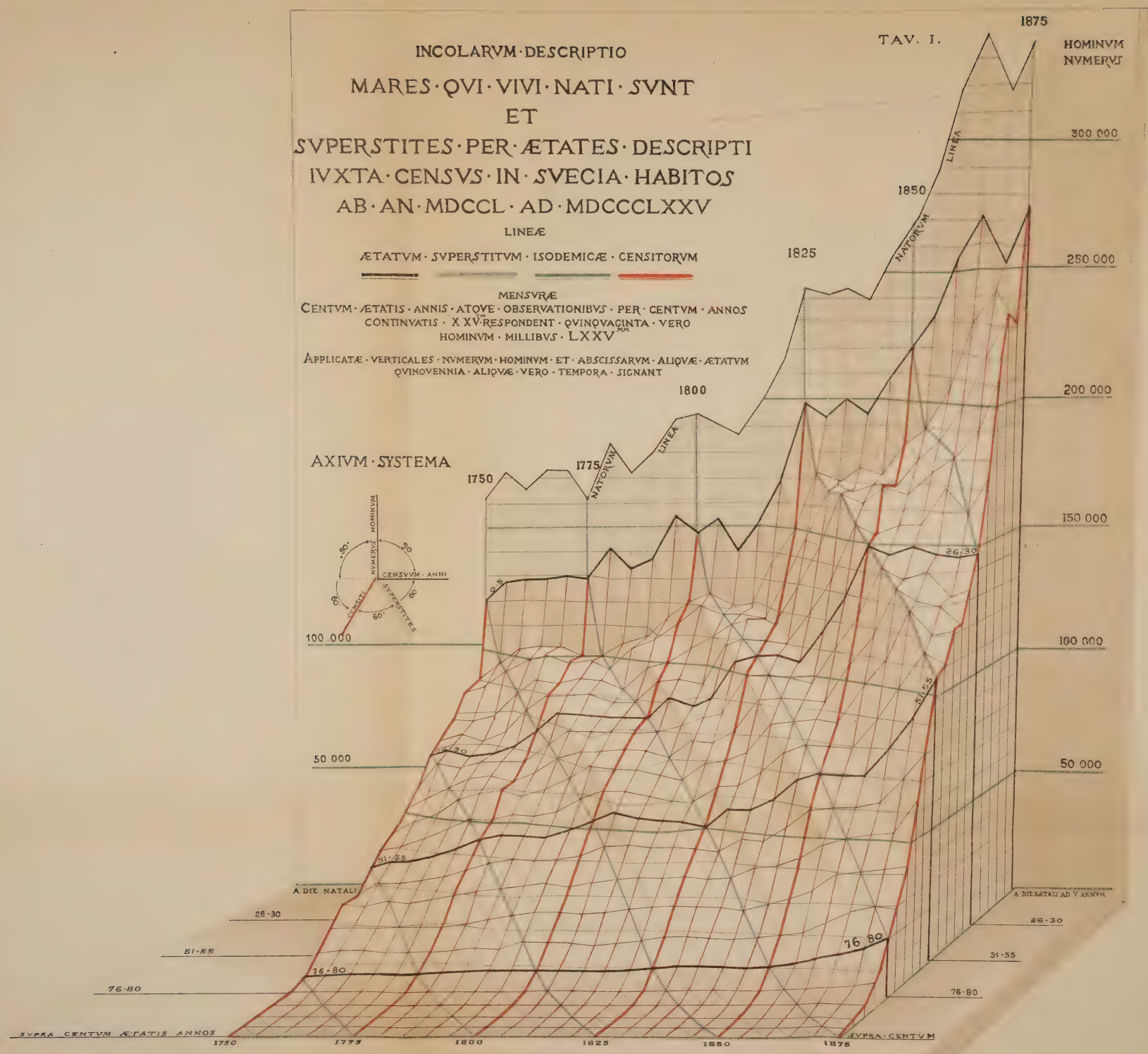


Fig. 2.a



NOTA. Le due figure di questa tavola rappresentano le proiezioni centrali dello Stereogramma, costruito colle scale sopra indicate e mediante tre assi di coordinate, ai quali è data la significazione nel Diagramma del SISTEMA DEGLI ASSI.



ITALIÆ · REGNVM · TABVLARIVM · CENSVALE · ROMÆ · AN · MDCCCLXXX

R.ª STAB. LIT. C. VIRANO ROMA 1885

ment (lignes bleues sur la figure), du fond en avant, la courbe de survie de chaque génération. On remarque ainsi comment une génération, faible à l'origine par le nombre de ses naissances, reste faible dans la suite des temps ; comment, à son tour, à quelque vingt ans de là, elle donne naissance à une nouvelle génération dont la faiblesse trahit encore la pauvreté de son origine. Une pareille figure est assurément très ingénieuse.

En voici un autre exemple dû, comme le précédent, à la statistique générale de l'Italie. C'est un stéréogramme indiquant la probabilité du mariage à chaque âge de la vie pour l'un et l'autre sexe, en Italie. Si l'on avait voulu représenter la chance qu'un homme d'un âge déterminé a d'épouser une femme d'un âge quelconque, soit de 20, 25, 30 ans, etc., il aurait suffi de tracer une courbe en prenant l'échelle de l'âge des épouses sur l'axe de abscisses et celle du nombre des mariages sur l'axe des ordonnées. Mais, dès qu'il s'agit de représenter la chance qu'un homme d'un âge quelconque a d'épouser une femme d'un âge quelconque, il faut combiner trois variables et, par conséquent, construire un solide ou une figure géométrique qui en soit l'expression. Sur ce solide dont nous ne pouvons donner que la projection, prise sur les deux faces (voir la figure ci-jointe, fig. X), il suffit de toucher du doigt un point quelconque pour y voir, à l'intersection d'une courbe rouge et d'une courbe bleue, le nombre proportionnel de personnes, hommes et femmes, d'un âge déterminé qui, en 1872 et 1879, ont contracté mariage en Italie.

Ce genre de figure n'est pourtant pas d'une application fréquente, parce qu'il ne saurait trouver place dans un texte imprimé et que, même pour un cours, il est, comme les cartes en relief, coûteux et encombrant.

Sans doute, on peut remplacer le stéréogramme par une figure de géométrie analytique. M. Lalanne et d'autres, après lui, ont fait d'ingénieuses applications de ce genre de figure ; mais elles supposent presque toujours des connaissances qui, pour être familières aux ingénieurs, ne sont pas nécessairement à la portée du vulgaire. C'est pourquoi nous pensons qu'il faut être très prudent dans l'emploi qu'on en fait pour la démonstration en statistique ; nous craignons que la majorité des lecteurs d'un livre ou des auditeurs d'un cours n'aient quelque peine à comprendre ou ne comprennent pas du tout de telles figures. Il ne faut pas oublier que les graphiques statistiques sont surtout un moyen de vulgariser les nombres, et que, dès qu'ils demandent à l'esprit plus d'efforts qu'il n'en faut pour étudier et comparer ces nombres, ils n'ont plus de raison d'être.

Nous avons fait connaître les trois catégories de graphiques usités en statistique : figures, cartes et solides. Il nous reste à conclure.

Quelques statisticiens ont essayé de formuler des règles pour la construction des graphiques et de fixer en quelque sorte cette langue scientifique, comme on a fixé la notation chimique. Sans doute, les mathématiciens ont à déterminer les procédés géométriques qui répondent le mieux à l'expression figurée des nombres ; mais ils n'ont pas à imposer de types déterminés de représentation. Il y a là matière à classifier, ainsi que nous avons essayé de le faire, plutôt qu'à réglementer. Tout graphique qui n'éclaire pas le sujet est condamné : voilà la règle suprême, qui n'est autre que celle de de la clarté.

Il ne faut, par conséquent, pas, ainsi que nous l'avons dit, mettre trop de courbes sur un diagramme, ni figurer trop de choses diverses sur une carte, et il faut disposer ce qu'on y met de manière que l'œil saisisse tout d'abord l'ensemble avec netteté et que l'esprit pénètre ensuite sans effort jusqu'à la notion des détails. Voilà les principales règles applicables à la *démonstration*, laquelle est l'objet le plus ordinaire qu'on se propose en dressant un graphique.

Ce n'est pas toutefois le seul objet qu'on puisse viser. Le graphique est aussi un instrument d'*invention*, non seulement dans les sciences naturelles, quand il fonctionne comme enregistreur, mais même dans les études statistiques, quand il n'est que la reproduction de données connues. En comparant les courbes de plusieurs faits portées sur un même diagramme, le statisticien, l'économiste, le moraliste découvrent souvent dans la similitude ou dans l'opposition des mouvements certains rapports qui leur avaient échappé, d'autres dont ils auraient eu peine, sans ce secours, à apprécier l'intensité ou la périodicité. C'est ainsi qu'apparaissent clairement les relations qui, dans une banque, unissent la circulation, l'encaisse et l'émission. Lorsqu'on a l'habitude d'employer les courbes pour représenter les phénomènes économiques d'un pays relatifs à la production, à la circulation, aux finances, à la démographie, comme nous le faisons souvent dans notre enseignement, on est frappé de la ressemblance qui se manifeste dans l'élévation ou l'abaissement du plus grand nombre des courbes, et on est conduit à conclure que la vie économique d'une nation résulte d'un organisme dont toutes les parties et toutes les manifestations sont solidaires les unes des autres. Pour les graphiques d'invention, il est encore moins opportun de donner des conseils d'exécution que pour les graphiques de démonstration. Celui qui cherche est seul juge des procédés qu'il croit le mieux adaptés à son esprit et le plus propres à le conduire au but ; l'important, dans ce cas, n'est pas que l'auteur

soit jugé clair, puisqu'il ne s'adresse pas à autrui, mais qu'il se comprenne lui-même. S'il y a une recommandation à lui faire, c'est de ne pas tomber dans l'erreur, trop commune, qui consiste à prendre une simple coïncidence des phénomènes pour un rapport de cause à effet; or, cette recommandation s'adresse non à la construction du graphique, mais aux conclusions qu'on en tire.

L'invention à l'aide des graphiques peut s'étendre, par delà les faits observés, à certaines prévisions de l'avenir. En effet, si deux séries de phénomènes observés se traduisent par deux courbes ayant une régularité mathématique, on peut supposer que, pendant un certain temps, ces phénomènes continueront encore à se produire de la même façon, et on semble autorisé à continuer géométriquement les courbes et à tirer ensuite quelques inductions de la manière dont elles se comportent l'une à l'égard de l'autre. M. Cheysson a donné au congrès de statistique de Paris une théorie de la construction de courbes de ce genre, lesquelles peuvent être utiles pour l'étude de certains problèmes d'économie politique. Toutefois elles ne doivent être employées qu'avec beaucoup de prudence, parce qu'on s'expose presque toujours à des déceptions en essayant d'appliquer aux sciences morales les procédés rigoureux des sciences mathématiques.

Le graphique peut être aussi un instrument de *contrôle*. Quand les chiffres sont alignés en colonnes, il n'est pas toujours facile de juger s'ils concordent. Quand ils sont transformés en graphiques, les moindres irrégularités du dessin sautent aux yeux : il ne reste qu'à chercher si l'anomalie résulte d'un changement réel dans l'intensité de phénomène ou d'une erreur de la statistique. M. Bodio a mis ainsi en lumière l'inexactitude des déclarations d'âge dans les dénombrements en montrant qu'il y avait toujours un excès pour les nombres ronds, 20, 30, 40, etc. Nous avons nous-même souvent occasion de montrer des erreurs du même genre dans notre cours de démographie, par exemple, lorsque nous dressons la pyramide de la population française par âges, et que nous faisons remarquer la saillie considérable que font du côté des femmes les assises représentant les âges de 20 à 25 ans, à côté du creux qui se produit dans les assises de 25 à 30 : les femmes, paraît-il, n'aiment pas à déclarer qu'elles ont plus de vingt-cinq ans. Elles ne se doutent certainement pas de l'indiscrétion du graphique qui trahit leur secret.

Qu'elle s'applique à l'invention, au contrôle ou à la démonstration, la statistique graphique ne saurait être trop vivement recommandée aux savants qui étudient les phénomènes dans leur cabinet, aux écrivains et aux professeurs qui les font connaître et qui en expliquent les lois dans leurs livres ou dans leurs leçons, aux directeurs de statistique et aux grandes administrations privées qui,

faisant des publications pour répandre la connaissance de certains faits, ne doivent pas craindre d'employer comme auxiliaire un moyen efficace de propager les résultats de leurs recherches. Plus ces recherches leur ont coûté de travail, plus ils doivent s'appliquer à en faciliter l'intelligence au public en lui épargnant une partie de la peine qu'ils ont prise eux-mêmes.

La statistique, qui n'a commencé à jouer un rôle sérieux que dans notre siècle, est devenue aujourd'hui nécessaire pour les études sociales et pour le gouvernement des États. Son importance continuera à s'accroître, malgré les critiques qu'on lui adresse, et dont les unes, bien fondées et très nombreuses, proviennent de sa propre insuffisance, les autres, plus fréquentes peut-être encore, ont pour cause l'ignorance ou la légèreté de ceux qui la consultent. Le mouvement qui fait participer de nos jours à la vie politique un plus grand nombre de citoyens qu'autrefois tend à augmenter sa clientèle ; il importe que les statisticiens seconden ce mouvement, et qu'en vue de la plus grande diffusion possible de leurs travaux, ils ne négligent pas un des instruments les plus propres à en vulgariser les résultats.

E. LEVASSEUR,
Membre de l'Institut.

On the Graphic Method *of* Statistics.

By Professor Marshall.

The graphic method of statistics, though inferior to the numerical in accuracy of representation, has the advantage of enabling the eye to take in at once a long series of facts. It has many forms: but to-day I shall speak only of its chief form, which is generally called the method of curves. Its defects are such that many statisticians seldom use it except for the purpose of popular exposition, and for this purpose I must confess it has great dangers. I would however venture to suggest the inquiry whether the method has had a fair chance. It seems to me that so long as it is used in a desultory and unsystematic manner its faults produce their full effect, but its virtues do not. I believe that if thoroughly organised, its special virtues will make it a great engine of scientific inquiry, and that a plan may be devised for obviating in a great measure its chief defects. The advantage of being able to take in at a glance the general bearing of many detailed facts is not of first-rate importance when we are considering only one set of facts. Accuracy is then more important than ease and rapidity of representation; and in accuracy the graphic method is inferior to the numerical. But ease and rapidity are essential when we want to compare many sets of facts together; because, if the mind is delayed long in taking in the general effect of one set, it meanwhile loses count of the others. Therefore I contend that the special function of the graphic method is to facilitate the comparison of different sets of statistics, and that it ought to be organised with reference to this purpose.

A simple table of statistics represents in one vertical row of figures a series of quantities of one kind, and in a parallel row a series of quantities of another, each horizontal pair standing in some definite relation to one another. In the method of curves each of these pairs is represented by a point; the vertical distance of the point from a fixed base line representing one of these figures, and its horizontal distance from a fixed base line representing the other. The statistical "curve" is, strictly speaking, a jagged line formed by joining these points. The most important class of statistical curves, at all events for my present purpose, is that in which one set of distances, generally the vertical set, express periods of time; I will call them *historical curves.*

We often speak of observing that certain causes produce a

certain result. But what we really do is to observe that the result happened at a certain time and that the causes were in existence at that or some earlier time; and then by a process of, perhaps unconscious, reasoning we infer that the result is rightly to be attributed to the causes in question. History says an event happened "at the same time as the cause," or "after this cause," and reason infers "therefore because of this cause." It suggests "*post hoc* (*or* "*cum hoc*) *ergo propter hoc.*" But history has not done its work unless it suggests not merely some, but all the causes, or at least all the chief causes which occurred at such a time that they may probably have had a part in bringing about the result. I wish to argue that the graphic method may be so applied as to enable history to do this work better than it has hitherto.

Great use has already been made of the plan of arranging on the same sheet of paper a group of curves, each of which tells one of the constituent parts of a piece of history, the measurement of time being the same for each of the curves. Such for instance is Fossick's diagram of the iron trade; in which one curve represents the British exports of iron and steel, another the total production of them, another the stocks of Scotch pig iron, and others the prices of different kinds of iron and steel. It enables us to see at a glance not only the general character of the change in each of these amounts, but also the relations in which the changes in one element stand to those in another. It calls our attention to sequences and coincidences of time, and prompts us to seek for the causal connection between them. For instance, it suggests an inquiry by calling attention to the fact that the stocks of iron begin to diminish a year or two before each crisis, and go on diminishing for a year or two after, and then begin to rise again. The same plan is applied elsewhere, as for instance in Jevons's "Investigations "of Currency and Finance," for the broader purposes of economics, and its usefulness has been approved by a wide experience.

My proposal is to extend this plan, to apply it not merely to one sheet of paper, but to a great many pages, which may be bound into one large book, or from which by proper selection many books may be made for special purposes. The sheaf of corn which our Society has chosen as its emblem is a broad one. A few stalks of corn bound together may just manage to stand up on a still day; but the sheaf that is to be firm and strong must have a broad basis. An isolated sheet of historical curves seems to me like a very slender sheaf.

I propose then that identical columns of figures should represent successive years on each of a great many consecutive pages, so that the same horizontal line should stand for one and the same year on every page. Each page should contain as a rule a group

of allied historical curves, while sometimes a page might supplement the curves on the adjacent page by a record of facts that cannot well be expressed by statistics, together with perhaps some subsidiary tables of figures. Some pages would be given to vital statistics, others to those of banking, railways, shipping, emigration, poor law, education, crimes, &c., and so on. Some would represent the broad features of England's trade with foreign countries, some would analyse its trade with particular countries, while others would analyse its foreign and domestic trade in particular commodities, and so on.

Were this done for England alone, it would suggest a great many new empirical laws to be analysed by reason and tested by experience. Without such assistance the historian is needlessly at the mercy of accident; he ascribes each event to the causes that he thinks of in connection with it. But possibly if he had turned over the pages of such a book as this, keeping his eye fixed at each horizontal level on each page, and noticing when any of those showed much irregularity in form, he might have been led to see that the explanation which had at first occurred to him was at all events not the whole of the truth. The value of such a book would increase much more rapidly than its size, because the numbers of ways in which the curves could be grouped together would increase much more rapidly than the numbers of the curves.

But valuable as such a book would be if it related to one country only, its highest use would be for international statistics: and that is the reason why I venture to submit it for discussion to-day. For the whole civilised world is more closely bound together for many purposes than the different parts of England were some time ago; we cannot now understand the events of one country unless we know something of the parallel events in others. Sometimes the necessary facts can be got from handy books such as our own statistical abstracts; but more often they must be hunted up from many books in many languages. And even when they are found, they are not so arranged that a general survey of them can be taken at once. But this would be done by the book I am pleading for.

For instance, if the history of the English iron trade were being investigated; after looking at the page containing the curves specially relating to it, one might turn in the first instance to those showing the history for England of the money market, of the purchasing power of money, of coal, of railways, of ship building, of foreign trade, of the price of corn and other necessaries, &c. And lastly, one would look at the pages giving the history of the iron trades of other countries. Not only would these last pages

supply important causes for English history that might have otherwise been everlooked, but they would help us to test our explanations of English history by applying them to parallel events in foreign history. For one thing, it would be useful to know how far the rule observed as to England, that large stocks of iron diminish in the years just before and the years just after a crisis, holds of other countries also.

Of course such a work must be expensive; but that is another reason for discussing the plan to-day. It could be so arranged as to be adapted for use in many countries: the edition published in each country having supplementary pages with such detailed information as was only of local interest. Again, by a proper selection of plates, books might be made up of special interest to particular classes of people, as, for instance, to agriculturists, ship owners, to the iron trade, and so on. I hope that the international society which we are to discuss to-morrow will in the course of time fix a standard gauge for the thickness of the strip allotted to each year, say a depth of five millimetres. It might also adopt a normal size for the page; though occasionally other sizes might be adopted for special purposes without very great inconvenience. Special provision could be made for those statistics which take as their unit of time any other period than a year.

The system of standard gauges and interchangeable parts has recently revolutionized many industries; and I think it may do great good to the statistical industry, rendering possible in it, as it has in other industries, the use of mechanical appliances, whose cost would otherwise have been prohibitive.

Let us then suppose that we have a large collection of historical curves on a standard gauge, perhaps bound up in a book or books, and containing, in appropriate places, pages of general history: I mean some of its pages might deal with such changes as cannot well be expressed by figures, and record them as nearly as possible in the horizontal lines that are appropriated to the period in which the changes have occurred. Let us then inquire more carefully what aid such a system of historical curves can give towards interpreting the past and anticipating the future, and what it cannot give.

The observation of the present and the experience of the past tell us what things happened, at what times and places, and nothing more. By themselves they explain nothing, but they supply materials from which we must ourselves infer the connection of cause and effect. We may do it with the formalism of of elaborate science, or in the rough and ready language of

ordinary life; but in substance our method is always the same. To explain an event we always consider what causes are likely to have brought it about; we inquire into these causes one after another to see what was the state of each of them at and before the time of the event, and then we use our judgment to decide what part of the result we shall attribute to each cause. Facts are the bricks out of which reason builds the edifice of knowledge. This system claims to do nothing more than to give, ready to the hand of the builder, a full supply of those particular bricks which he wants for any purpose.

Suppose an event A happened in the year 1880, and we think it may have been due to causes B, C, D, &c.; this system will show almost in an instant what were the states of B, C, D, &c., in 1880, and the previous years. Also by calling attention to a remarkable change at about that time in some other cause, K, it may put us on the track of a causal connection that might otherwise have been overlooked. What it cannot do is to tell directly the nature of the dependence of A upon B, C, D, &c. That must be done by our reason making use of that abstract and essence of past experience which is on one side science, and on the other practical instinct. But every fresh study of the curves helps to strengthen us in this work, and to verify and improve our estimates of the nature of the effect to be assigned to each cause.

All this can be put much more clearly and definitely if I may for a moment borrow the language of Mathematics, the sister science of Statistics. I call them sister sciences, because they both deal, directly at least, only with those causes and effects whose condition can be expressed in terms of quantity. Statistics organises the collection and arrangement of particular statements as to quantity. Mathematical language enables us to express general statements as to quantity with the utmost brevity, precision, and force; and mathematical theory reasons on the basis of these statements. It is true that the results obtained by statistics generally, and in particular the economic branch of statistics, are seldom sufficiently definite and trustworthy to afford much useful material for mathematical *theory* to work on; but they are sufficiently definite to be able often to gain a great deal by having their general tenor stated in the mathematical *language*. Every statistical table suggests the expression of the thing whose quantities it shows in one column, as a function of the thing whose quantities it shows in another. A historical table of statistics suggests the expression of something as a function of time; and in the corresponding historical curve this suggestion takes a geometrical form which brings it one step nearer to the language of mathematics.

If, for instance, U be the quantity of the effect A in any year, then the increase of U during that year is its rate of growth at that time.* So if X, Y, Z . . . be the quantities at that time of B, C, D . . ., the curves tell us their rate of growth.† Now A being a function of B, C, D . . ., the rate of growth of A is made up of that part which is due to B, that part which is due to C, and so on. The part which is due to B is the product of the rate of growth of B into the dependence of A on B,‡ and so for C, D, &c. The whole growth of A is then made up of the sum of these products.§

This is, I repeat, merely writing out explicitly the implicit process by which every thinking man reasons, whether he uses statistics or not. It is, for instance, the way in which a farmer analyses his experience of the advantages of feeding his stock with oil cake; though no doubt it would take him some time to recognise his own offspring in this attire.

What then I claim for the system of historical curves is that they supply in the most convenient possible form one set of the factors used in every explanation of the past and forecast of the future, in so far as it is based on an estimate of quantity. They supply the rates of growth of the possible causes; reason by aid of theory, which is the abstract of past experience, supplies the other set of factors, viz., the nature of the dependence of the result observed on the several causes.||

It must however be admitted that the method of historical curves labours under some just discredit in consequence of its often suggesting misleading notions as to the comparative rates of growth

* It is expressed as $\frac{dU}{dt}$.

† That is $\frac{dX}{dt}, \frac{dY}{dt}, \frac{dZ}{dt} \ldots$

‡ That is $\frac{dU}{dX}$.

§ That is $\frac{dU}{dt} = \frac{dU}{dX} \cdot \frac{dX}{dt} + \frac{dU}{dY} \cdot \frac{dY}{dt} + \frac{dU}{dZ} \cdot \frac{dZ}{dt} +$ &c. Sometimes it is best to separate that part of the growth of A which can be ascribed directly to the lapse of time, from that which is to be ascribed indirectly to time through its influence on B, C, D, &c. In that case we write

$$\frac{dU}{dt} = \frac{dU}{dt} + \frac{dU}{dX} \cdot \frac{dX}{dt} + \frac{dU}{dY} \cdot \frac{dY}{dt} + \text{\&c.},$$

it being understood that the $\frac{dU}{dt}$ on the right hand side of the equation is "partial," and that on the left is "total."

|| The curves tell us $\frac{dX}{dt}, \frac{dY}{dt}$, &c.; reason supplies $\frac{dU}{dX}, \frac{dU}{dY}$, &c.

DIAGRAM A.

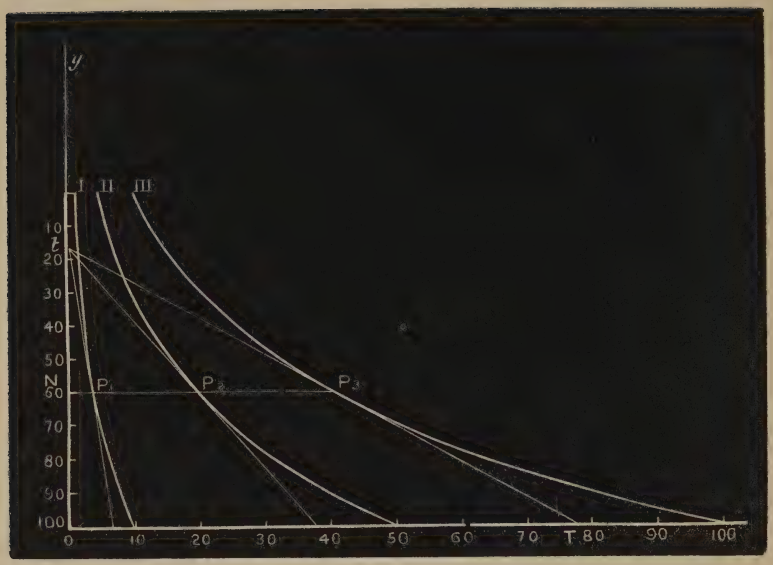
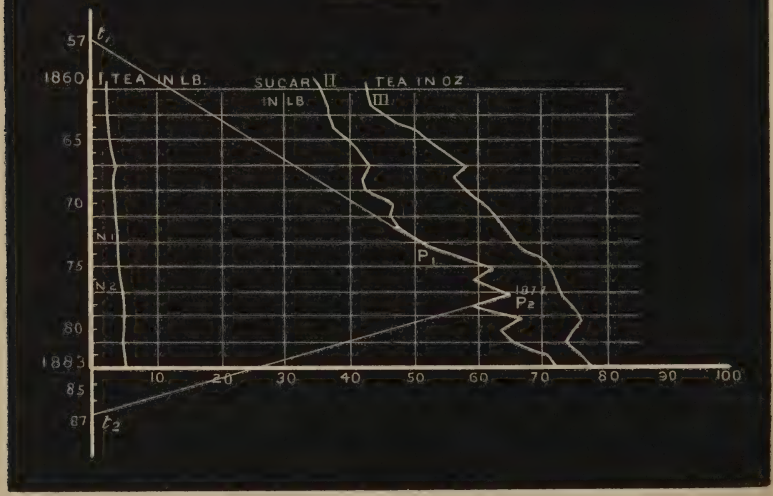


DIAGRAM B.



of different things. The difficulty would not be so great if we were concerned chiefly with the absolute amounts of increase; it is not difficult to infer from the historical curve for shipping clearances that they have increased by so many thousand tons. But for the purposes of comparison with other curves, as for instance that of train mileage, this is not what we want to know. What we want to know is the percentage of increase. Though there is not much interest in comparing so many extra tons of shipping clearances with so many extra miles of train mileage, there is great interest in comparing an increase of one-tenth in the tonnage of shipping clearances with an increase of one-sixth or one-twelfth in the train mileage during the same period. In other words, we want to compare what we may call their *proportional rates of increase.* For I would define the proportional rate of increase of a thing to be *the ratio in which the increase during, say, a year, bears to the amount at the beginning of the year.*

It cannot be denied that the suggestions which historical curves give as to the comparative rates of increase of different things depend very much on the scales on which they are drawn. This evil is considerable even in the case of such prices of commodities and securities as practically oscillate about a fixed level. It is greatest in the case of things that increase very rapidly, whether at a fixed rate or not.

For instance, it requires a trained eye to see that the same proportional rate of increase is represented at every point on Curve II in Diagram A. Not only is this the case, but Curve II is identical with Curves I and III. Each of them represents the growth of the population of London on the supposition that, starting at one million, it had increased for a century uniformly at about its actual mean growth during the last thirty years. That is to say each of them represents the growth at the annual rate of about one forty-third annually, so that it doubles in about thirty years, and is multiplied exactly tenfold in one hundred years. The only difference between the curves is that the horizontal scale is five times as large for the second curve, and ten times as large for the third curve, as it is for the first.

Again, in Diagram B the consumption per head of tea and sugar in the United Kingdom for the years 1860 to 1883 is represented to the same scale in pounds in Curves I and II. The danger of the popular use of statistical curves is illustrated by the fact that an orator might perhaps carry his audience with him while he argued that they showed a much more rapid growth of the consumption of sugar than of tea. But really there is very little difference between the two, as is seen on comparing Curves II and III, in which a pound of sugar is compared against, not a pound,

but an ounce of tea. Again, in Diagram C, Curves I, II, and III represent the marriages, deaths, and births in England and Wales in each year of the present century. But it is difficult for the eye without some artificial aid to compare the rates of increase at different parts of the same or of different curves.

For this class of difficulties several remedies have been proposed. Expert arithmeticians sometimes translate the curves back into columns of figures; others acquire a considerable skill in measuring and comparing lines with the eye. Sometimes a curve is drawn to a new scale for special purposes; one instance of this has been seen in the case of the tea curve, but a better instance can be seen in Curve IV in Diagram C, which represents marriages on four times as large a scale as the births. From this we see that the ratio of births to marriages has been nearly steadily increasing from something less than four to something more than four.

Another method that can be occasionally used, is to draw supplementary curves showing for each year or decade the rate of growth during it. Again, another method is to make the distances horizontally represent the logarithms of amounts. On this plan lines of equal slope denote equal ratio of increase; and therefore the three curves on Diagram A would become parallel straight lines. But this last plan labours under the disadvantage of not presenting quantities as they are, but only their logarithms; and for ordinary use this far more than outweighs all its advantages. Moreover, many of these advantages may be secured by a plan which can be applied at once to the ordinary historical curves, and it is to this that I want specially to draw your attention.

If a ruler be placed so as to touch a historical curve at P (see Diagram A), $t\,N$ being the vertical distance above P of the point t at which the ruler meets the vertical base line, then the proportional rate of increase at P is the *inverse of the number of years represented by* $t\,N$. It will be found on trial that $t\,N$ is the same number 43 (or more strictly $43\frac{1}{2}$) for every point on each of these curves, which, when interpreted, means that each curve, throughout the whole of its length, represents an annual increase of $\frac{1}{43}$. Whatever be the scale on which the curve is drawn, this plan gives at once an exact measure of the proportionate rate of growth.*

* The law is that if $x = f(y)$ be the equation to the curve, y being measured downwards from a fixed horizontal line to represent time, and x being measured along $O\,x$ to represent quantity, the rate of proportionate increase is $\frac{1}{\Delta y} \cdot \frac{\Delta x}{x}$, or in the limit $\frac{1}{x}\frac{dx}{dy}$, *i.e.*, $\frac{1}{Nt}$. In this case the equation to each curve on its appropriate horizontal scale is $x = 10^{\frac{100}{y}}$ $\therefore Nt = 100 \log._{10} e = 43{\cdot}5$ approximately, and is the same for all points on the curve.

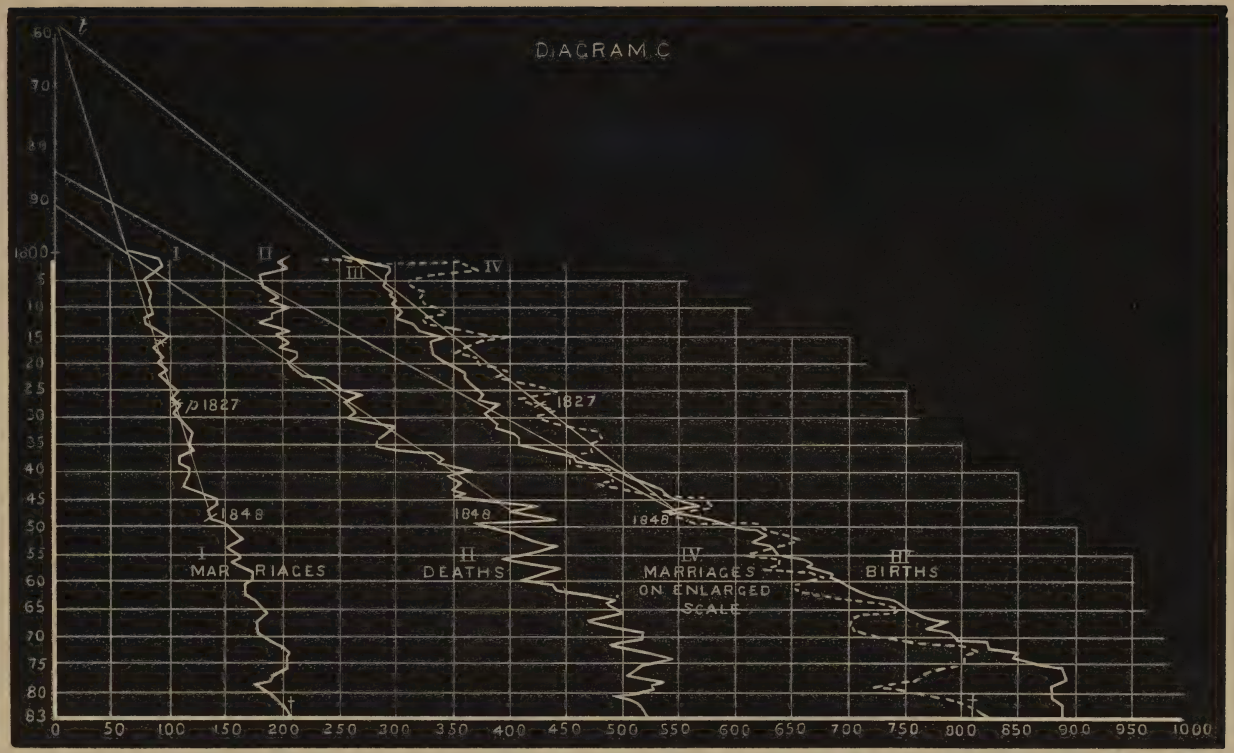


DIAGRAM C
I
II
III
IV
1827
1848
I
MARRIAGES
II
DEATHS
IV
MARRIAGES
ON ENLARGED
SCALE
III
BIRTHS
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000
1800 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 83

If the curves had shown a diminishing population, t would have been below N, and then the inverse of the numbers of years represented by $N\,t$ would have been the annual *proportional rate of diminution* at P.

But instead of wanting to know the rate of growth at a point on the curves, we may want to examine the growths between two somewhat distant points, or periods: it is this that we nearly always want to do in the case of discontinuous, or broken, curves such as those in Diagrams B and C. A strict geometric mean of the proportionate rate of growths between the two periods requires the use of logarithms; but an arithmetic mean, which can be found by a simple rule, is sufficiently accurate for most purposes. For instance, when we are considering the increase of births in England and Wales between say 1827 and 1848, it will be sufficient for most purposes to know what fraction of the births in 1827 will have to be added in each of the twenty-one years from then to 1848 in order to get the number in 1848. To this fraction I shall give the name the *average proportionate rate of increase*, in order to distinguish it from the true geometric mean.

The rule to determine this is substantially the same as before. We first find the point on the curve corresponding to these two years 1827 and 1848; we draw a straight line through the two points, and see where it cuts the vertical base line $O\,y$; we find this is at the year 1785, that is forty-two years before 1827. Then the rule gives us $\frac{1}{42}$ as the fraction required.

Applying the same rule to the curve of deaths for the same years 1827 and 1848, we find that the line joining the corresponding points cuts $O\ y$ in the year 1791, thirty-six years above 1827; therefore the average proportional rate of growth of births between 1827 and 1848 is $\frac{1}{36}$. If we do the same by the two curves for marriages we find that they meet (as of course they must) in the same year, 1755, showing that the average proportional rate of increase of marriages for the period is $\frac{1}{72}$.*

I submit then that this simple rule enables us with but very little pains to escape from the bewildering influences of changes in the horizontal scale to which historical curves are drawn. We have only to get into the habit of sliding a ruler or a pencil along the curve, and of watching the vertical distance through which it rises between the point at which it leaves the curve and the point in which it cuts $O\ y$; remembering then that the

* If the quantities observed had been diminishing instead of increasing between these two periods, the line joining the two corresponding points would have cut $O\ y$ below them, and the vertical distance of this point of intersection below the upper of the two chosen points gives the increase of the average proportional rate of diminution.

annual proportionate rate of growth varies inversely as the number of years represented by this distance, we shall be able to use historical curves without risk. We shall read them truly, and therefore with the same result, whatever be the scale on which they are drawn, and however misleading would be the notions with regard to the proportionate rate of growth which they would suggest at first sight. We shall, I think, have got over the one valid objection to the general use of historical curves.

I may add briefly that there is a somewhat similar difficulty in the interpretation of a large family of statistical curves, of which one instance is found in what economists call *the demand curves.* We may want to find a measure of what may be called *the elasticity of demand;* that is, when a fall of price leads to an increase in the amount demanded, we may want to know the ratio in which the percentage by which the amount demanded has increased stands to the percentage by which the price has fallen. If, for instance, in Diagram A the amounts demanded are measured along $O\,x$ and the corresponding prices along $O\,y$, so that Curve III becomes a demand curve: then the elasticity of demand represented by the curve at P can be determined by a simple rule. Let a straight line touching the curve at P meet $O\,y$ in T and $O\,x$ in t, then *the measure of the elasticity required is the ratio of* $P\,T$ *to* $P\,t$.

If $P\,T$ were twice $P\,t$, a fall of 1 per cent. in price would cause an increase of 2 per cent. in the amount demanded; the elasticity of demand would be two. If $P\,T$ were one-third of $P\,t$, a fall of 1 per cent. in price would cause an increase of one-third per cent. in the amount demanded; the elasticity of demand would be one-third: and so on. I believe that inductions with regard to the elasticity of demand, and deductions based on them, have a great part to play in economic science.

The PRESIDENT said that after the three valuable and important papers that had been read, he would not read to the meeting the two small papers with which Mr. Francis Galton had favoured them, but he would call the attention of the members to them, as they were of great interest, and might be very useful. One of them pointed out a common error in statistics in which the fraction affected a very small unit, though in a very large number of figures no important effect was produced. The other paper was on the application of a graphic method to fallible measures.

A Common Error *in* Statistics.

By Francis Galton, F.R.S.

I desire to direct attention to the fact that a common method of calculating mean values in certain classes of observations is vitiated by an error that, curiously enough, has not attracted attention, though it is large and of a character that no multiplication of observations can eliminate. It is a fundamental oversight of somewhat serious importance, that detracts from the professed accuracy of many published tables of results.

To fix the ideas, I will explain myself by taking a definite case, leaving it to be understood that the criticism has much wider application. I will suppose then, that we are dealing with a mass of observations referring to the stature of a population, and that we adopt the common method of including all measurements noted as of, say, "65 *inches and less than* 66 *inches*," in a column headed 65—; those of "66 *inches and less than* 67 *inches*," in a column headed 66—, and so on; then of counting the entries in the columns, and referring the means of them severally to 65·5, 66·5, &c., inches. Let us imagine that the identical observations have been separately recorded on two forms, *a* and *b*, but that in *a*, the entries are to the nearest inch; in *b*, to the nearest tenth of an inch. In the *a* cases, all measurements of 65·51 inches would have been entered as 66; consequently the column headed 66—, would include all actual measurements lying between 65·5 and 66·5, whose mean value would be 66·00 inches. In the *b* cases the column headed 66—, would include all actual measurements lying between 65·95 and 66·95, whose mean value would be 66·45 inches. Hence the results given by the same observations, however numerous they may be, and whatever their intrinsic value, will differ by nearly half an inch, simply according to the degree of minuteness with which they were written down, whether to the nearest inch or the nearest tenth. The conclusion is, that the degree of minuteness to which measurements are *recorded*, is an element of calculation that must be ascertained and allowed for, whenever the above method of obtaining mean values is employed.

The Application *of a* Graphic Method *to* Fallible Measures.

By Francis Galton, F.R.S.

The following method of dealing statistically with values that vary in one dimension is singularly easy and of great convenience. It differs slightly in detail from what I have already published, and I shall add to it a new and very useful little table.

The observed values are supposed to be marshalled in the order of their magnitudes, and to be severally represented by vertical ordinates of lengths corresponding to the respective magnitudes, and these ordinates are supposed to be erected on a horizontal base, at equal distances apart, between two termini. The first ordinate will be separated from the first terminus by a half-space; the last ordinate will similarly be separated from the last terminus by a half-space, and each ordinate will be separated from the adjacent ordinate or ordinates by a whole space. The tops of the ordinates are then joined with a free hand to form a "curve of distribution," which always resembles more or less the peculiar ogival curve shown in fig. 1. The same curve broken in two parts, and the lowermost reversed, is shown in fig. 2:—

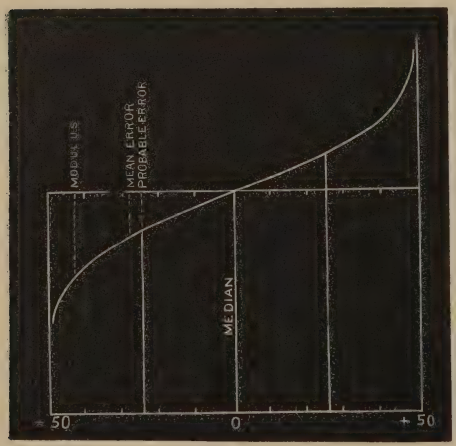


Fig. 1.

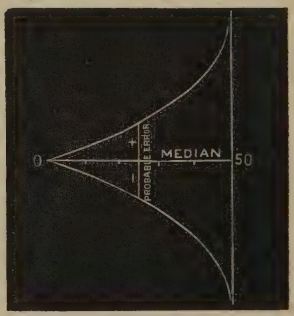


Fig. 2.

To express fig. 1 numerically, it is sufficient to measure and record the values of a very few of its ordinates corresponding to fractional lengths of its base. These values can at any subsequent

time be plotted anew as ordinates to a base either of the same or of any other convenient length; then by joining the tops of those ordinates with a freely drawn line, the features of the original curve will be reproduced. The middlemost ordinate will by construction give the median value, that is to say, the value which one half of the observations exceed, and the other half fall short of. The first and third "quartile" ordinates will similarly give the values that one quarter of the observations exceed and that another quarter fall short of. These are most useful data, because the median value is practically identical with the mean value, and half the difference between the quartiles is the "probable error" of the series, which is perhaps the most convenient unit for measuring its variability.

I lately ("Journal Anthropological Institute," vol. xiv, p. 277) gave a table of statistics on this principle, in which the base was divided into 100 parts, and I named the ordinates at the middle of each of those parts, "percentiles." They were there reckoned from 1 to 100; but a considerable amount of subsequent experience has shown it to be more convenient to call the middle division 0^0, and to reckon outwards on either side of it, to + 50 and to − 50 respectively. Fig. 2 admits of being expressed according to this arrangement; it is useful as showing with much distinctness the range within which any required fraction of the observed values are found to vary.

The precise method of plotting the observations is best explained by an example, Table I. The observations are first summarised as in line A (paying regard to the source of error I pointed out in the preceding paper). The meaning of A is that in a total of 775 observations there were 2 cases measuring 29 and under 30 inches, 8 cases measuring 30 and under 31 inches, and so on. The line B contains the sums of the entries in line A, reckoned from the beginning, and is to be read as follows: 2 cases under 30 inches, 10 cases(= 2 + 8) under 31 inches, 62 cases (= 2 + 8 + 52) under 32 inches, and so on. The line C contains the reduction of line B into percentages: it is these that I plot upon sectional paper, decimally divided from 0 to + and − 50.

We see in line C, that 0·2 per cent. of the observations were short of 30 inches, consequently the next higher measurement will exceed 30 inches, therefore there is no noteworthy error occasioned by accepting 0·2 as the abscissa corresponding to the exact ordinate of 30 inches. Similarly we may accept 1·3 as the abscissa corresponding to 31 inches, and so on, as shown in line D. These are the values that I plot, and from which I draw my curve of distribution, whence I measure off ordinates at 10°, 20°, 25°, &c.

TABLE I.—*Height, Sitting, of Female Adults, Aged* 23—50, *in Inches.*

	29—	30—	31—	32—	33—	34—	35—	36—	37—	
A	2	8	52	116	226	227	108	31	5	Total 775
B	2	10	62	178	404	631	739	770	775	Abscissæ 0 to 775
C	·2	1·3	8·0	23·0	52·2	81·4	95·4	99·4	100·0	Abscissæ 0 to 100·0
D	30	31	32	33	34	35	36	37	38	Corresponding Ordinates

It is usually found that a series of observed values are "normally" variable, that is to say that they conform with sufficient exactitude for ordinary purposes, to the series of values calculated from the *à priori* reasonings of the law of Frequency of Error. My method of plotting the observations enables us very readily to test the presumed conformity in any given case, and, if it exists, the plotted curve not only give us the probable error of the series, but also the mean error and the modulus.

To perform this test we must shift our line of reference. The base line on which the ordinates were reared, and the ordinates themselves, must both be abandoned, and we must take instead of these the horizontal line drawn through the top of the ordinate at 0°, and a new set of ordinates drawn from that horizontal line to the curve. These new ordinates obviously represent the differences between each observed value and the mean of all the observed values, and they may be variously described as deviations, divergencies, or errors, according to the character of the observations in hand. It will be convenient to call these new ordinates by the general term of " deviates."

The accompanying table, Column B, gives the theoretical values of the deviates at specified points in the curve, in terms of the probable error. I have obtained those in column A by interpolation from the familiar table of values of the well known integral in the Law of Frequency of Error, such as will be found in an abbreviated form in Airy's "Theory of Errors," p. 22, where the values of the deviates are calculated in terms of the modulus. Column B has been deduced from A by simple proportion.

TABLE II.—*Normal Curve of Distribution of Error.*

Abscissæ, reckoned from 0° to ± 50° (Value of the Integral).	Corresponding Ordinates.	
	Value of the Deviate in which Modulus = 1. A.	Value Reduced proportionately to Probable Error = 1. B.
10	0·179	0·38
20	0·371	0·78
Probable error 25	0·477	1·00
Mean ,, 28·7	0·564	1·18
30	0·595	1·25
40	0·906	1·90
Modulus ..... 42·1	1·000	2·10
45	1·163	2·44
47	1·330	2·79
49	1·651	3·46
50	Infinite	Infinite

In order to bring the observed values into a form suitable for comparison with this table, we must begin by measuring the observed deviates at ± 10°, 20°, 25°, 30°, 40°, and 45°. The mean of the ± deviates at 25° gives, by construction, the "probable "error." This must be considered as unity, and all the other observed deviates must be reduced proportionately to it. Then, if the series is "normal," the values so obtained will be identical with those in Column B, and if it is approximately normal, they will correspond approximately. In the former case the value of the deviate at 28·7 will be the value of the mean error exactly, in the latter case very nearly so. Similarly the deviate at 42·1 will give the modulus.

I have, during the last few months, had occasion to make considerable use of this graphic method of dealing with fallible measures and variable values, and have found it in every way satisfactory. The sectional paper I have latterly employed is that sold by Messrs. Letts, 36, King William Street, London Bridge, ruled in inches and tenths; which is, however, on somewhat too large a scale for the convenient plotting of percentage abscissæ, while that of millimetres is too small. On the whole, when I next have occasion to work in this way, I think it will be best to try sectional paper, decimally ruled, in which the unit of distance between line and line is one-sixteenth of an inch.

Discussion.

Professor Foxwell said he did not feel that he was competent to express an opinion upon the very interesting and profound papers to which they had just listened. Mr. Edgeworth's paper related to a subject of the greatest importance to statisticians. If he (Mr. Foxwell) understood his argument, it was that they required the assistance of science in order to tell them whether a particular difference in a statistical average, for example, was a significant one, or merely one which might be the result of accident or chance, that is to say, of some cause which, for the purpose of the particular investigation, they did not think it important to take into account. He was not able to appreciate the long and difficult chain of mathematical reasoning by which Mr. Edgeworth had arrived at his results; but he had every reason to believe that those results were well founded, so far as he could discover from conversations with others who were better qualified than himself to express an opinion upon the point. As to the interest of the inquiry, there could be no doubt it was certainly one that must be regarded as of great value and importance. Professor Marshall's paper appeared to him to be a very valuable and important one. He confessed that he was one of those who had drawn conclusions from a mere inspection of diagrammatic curves, which had not been warranted by the facts on which the curves were based; and he agreed in thinking that those curves might be very deceptive, and that without some such scientific apparatus as Professor Marshall had suggested, it would be impossible by mere inspection to avoid being sometimes led into error. Both the papers pointed out the extreme value and necessity of what might be called *la haute statistique*, the higher branch of statistical theory and research; and he felt sure that it would be the desire of the Society to encourage papers of that kind by every means. He hoped too that the suggestion of Professor Marshall as to the construction of statistical forms of an interchangeable kind on a scale common to all nations would not be allowed to drop, and that something more would be heard of them on the following day, when, as he understood, practical resolutions would be proposed. He had no right to make any further remarks on a subject on which he did not profess to be an expert.

Mr. John B. Martin said that he had had the advantage of being at the American meeting for the Advancement of Science in Philadelphia in September last, and on going into the Statistical and Economic Section he found that a discussion was going on on the graphic method. He had been tempted to call attention to the fact that there was no uniformity in the graphic method in matters of practical detail. They had illustrations by curves, by the practically similar system of straight lines, by squares, by segments of

circles, and the like. He thought it might be well to consider whether it would not be desirable that preference should be given where practicable to one, and if so to which of those methods. He had made a remark to that effect before the American Association, and a reply was given to him that a committee had been appointed to take the matter into consideration and to report on it. It was one of the sins of omission, many of which he had had to confess in regard to the present meeting, that he had not written to ask what had been done in that direction. Perhaps General Walker, who was present, might be able to enlighten them upon that point.

General Walker regretted to say that he did not know what action had been taken by the Committee of the American Association for the Advancement of Science. It was not his privilege to attend the meeting of the Association in Philadelphia last year, and he was not even aware that a committee had been appointed for the purpose stated by Mr. Martin. He was quite sure that Professor Marshall did not wish to be understood to say that those who were called to lecture to popular audiences on political economy, history, and various social subjects, should not use diagrams under any circumstances. Figures, all knew, might be so used as to deceive by those who had a dishonest intention, in the presence of those who are not competent to judge of them. In like manner, graphic illustrations of statistical matters might be made to produce a false impression; but in the hands of one who desired to produce only the impression of truth, and before those who were qualified to receive instruction, it appeared to him that graphic methods such as were generally employed might be made use of in popular instruction to good effect. He had, however, been much impressed with certain dangers attending the use of graphic methods of statistics which Professor Marshall had very clearly and strongly set forth. The paper just read seemed to him of very great value, although he did not think that, where there was sincerity on the part of the instructor, the graphic method was more liable to abuse than the figures themselves from which the diagrams or maps might be constructed.

Mr. Price-Williams said he had been particularly struck with the suggestion of Professor Marshall for the adoption of a standard gauge for graphic curves, and he had been waiting in expectation that on the discussion the subject would have been taken up. He considered it afforded the only practical solution of a difficulty in applying the graphic method to which Professor Marshall had alluded, in connection with his (Mr. Price-Williams's) diagrams, and to which Dr. Longstaff, on a previous occasion, had also called attention. He entirely agreed that so long as they adopted a standard gauge for the ordinates, the scale of the abscissæ did not so much matter. He hoped that at the meeting on the following day a decision would be come to approving the adoption of a standard gauge, which he considered might be applied with great advantage in connection with the statistics of many important

branches of the engineering profession, to which he belonged. He might mention that he had for many years adopted the graphic method, not only in dealing with population, but in connection with a variety of engineering statistics. With reference to the diagram of the population of London, he would point out, as confirming what Professor Marshall had said, that the increase between 1871 and 1881 was only 17 per cent. In the diagram of Liverpool it would be noticed that although between 1821 and 1831 the curved outline was much flatter than in the case of London, it represented an increase of over 42 per cent., the increment of decennial increase being only 200,000; whereas the 17 per cent. increase in the case of London represented an increment of over 500,000, an amount of increase considerably larger than the entire populations of Liverpool and Manchester at the date of the last census.

Professor Marshall said he was afraid he had been misunderstood. What he had meant to say with regard to the use of curves for popular lectures only had reference to curves that compared rates of increase. For almost all other purposes he thought curves might be used, and he certainly should be unwilling to see them entirely banished from popular lectures.

Dr. G. B. Longstaff said he had the misfortune of being neither a mathematician nor a French scholar, so that he had not been able to follow the paper throughout. M. Levasseur's account of the graphic method appeared to him to be most masterly. The subject was one which had engaged his (Dr. Longstaff's) attention for a considerable time, and he was glad that it had been brought before the meeting. The maps which had been exhibited showed at once the imperfections of that method of representing figures. For certain purposes the cartogram was the only method available for the representation of figures graphically, but it was open to very grave objections. In regard, for example, to the question of the density of population it was not possible to indicate in that way the great density of the population of Paris in comparison with the very sparse population of some of the departments; there was a lack of scale. In whatever way colours were used, scale could only be very imperfectly represented. The choice and scale of colours must be perfectly arbitrary. A spot of red, for example, which might be very bright, representing Paris, would by no means adequately convey to the eye the mass of population there concentrated. The method of cartograms, therefore, was more applicable to a smaller area such as particular divisions of London or of Paris, or the communes of a particular department. That, he thought, was a weakness in the method which M. Levasseur would recognise. There was a difficulty in regard to the use of curves which had also been referred to by Professor Marshall. The curve of life exhibited by M. Levasseur was an extremely interesting and instructive one. It would be seen that the first portion of the curve approximated to a hyperbola in outline. But when they had curves approximating to asymptotes of hyperbola, it was impossible

to make comparisons between them. There was, therefore, this defect in such a diagram, that whereas the central portion was good for comparisons, the two extremities were comparatively imperfect, and gave some erroneous ideas. The question of using radii of circles as employed by Dr. Farr in his report on the cholera in 1849 had not been referred to by M. Levasseur. That method had one advantage, and he thought one advantage only—it was useful for comparing cyclical phenomena that varied with the season. In the case of a phenomenon such as the average weekly or monthly death-rate or price of corn, or anything varying with the season, the curve was essentially a closed curve, and taking a mean for a number of years, it should not be represented as the curve shown by M. Levasseur, beginning at one end and closing at the other, but the two ends should be brought together and the curve should go round and round. That was the true method of representing a mean—an irregular figure more or less like an ellipse—but it had the practical objection that the eye had a great difficulty in measuring radii, and therefore the facts were not conveyed with such distinctness to the eye as might be desired. With reference to the use of surfaces, such as rectangles and the like, they had their advantages for some purposes, such as lectures, but not for such purposes as Professor Marshall had especially referred to, and he entirely agreed with him that the curve, which was after all but another method of graphic representation by lines, since it was merely the *locus* of the extremity of the lines, was essentially the method of graphic representation which was most useful and most promising. The idea of having a common scale of time on a curve was an extremely useful one. He (Dr. Longstaff) had a scale of time of his own, which he had employed for a number of curves referring to different subjects. He thought that curves drawn in a hap-hazard way like those of Professor Marshall —such as curves of sugar and tea—on some conventional vertical scale which were not comparable, were extremely deceptive, and ought not to be exhibited to popular audiences. The same remark applied to some of the beautiful diagrams of Mr. Price-Williams. The lines representing the rate of increase of population in Liverpool and in London were on a different scale; they were both arbitrary and not comparable. The mistake might be made of supposing that one of those districts had increased relatively more rapidly, whereas it had increased more slowly. That difficulty would be got over where the rate of increase was important, or where it was necessary to compare two things by adopting another method: the curves should be manipulated to bring them to a common scale. Where there was a constantly increasing growth, as in the case of population, he thought the most convenient method was to take the initial ordinate as unity, and make each successive ordinate a multiple of the first. Thus, for example, the rates of growth of two populations could be readily compared irrespective of their original amounts, if the initial population were taken as 100, and each division of the vertical scale taken as $\frac{1}{100}$ part of the initial quantity. In the case of a curve for a fluctuating result the simpler plan was to ascertain the mean, and then to take the

quantity for each year, and calculate what percentage of the mean, above or below, the number for that year was. Taking a number of prices of tea or sugar, or quantities, they could ascertain the mean and calculate for each year the deviation from the mean; then they compared not the absolute quantities but the fluctuations one with another, and in that way they removed a great number of pitfalls that would otherwise lie in their path. The essential point was that the same diagram was not suited for showing with clearness at the same time absolute quantities and relative fluctuations of those quantities.

Herr Körösi said that Dr. Longstaff's proposals in regard to the mode of representing the accumulation of population would be found very useful in practice. At the Exhibition of Buda-Pest there was a table containing the growth of the populations of all the great cities of Europe from the beginning of the present century to the last census. It was found that English cities were those that increased most rapidly. The first of all European cities in the list was Bradford, the second Brighton, and the third Christiania, where there was an accumulation of suburbs and small villages. The fourth place was taken by Pesth, which in the beginning of the century had only a population of 40,000 or 50,000, but at present contained a population of 420,000. It was interesting to observe that there were some cities, English, Italian, and Belgian, which had not increased during the last two decades.

Mr. Edgeworth said he wished to ask Professor Marshall and other experts whether they would attach any value to a mode of representing the weight of curves, which he had only seen in a number of an insurance magazine—a curve so drawn as to show the number of observations belonging to the curve. It was represented something like a stream. When there were a great number of observations the stream widened, and a greater number of dots were put inside. That prevented anyone from attaching importance to a curve when it did not rest on a great number of observations. He would couple the question with his own suggestion of representing not only the weight due to mass, which was more familiar, but also with what might be called specific weight, with which he was more particularly concerned—the weight attaching to each particular class of phenomena. Marriage curves, for example, would have, *cæteris paribus*, much more weight than death curves, because marriages were much less oscillatory than deaths; and if they agreed to weight curves according to their mass they ought in consistency to weight them according to their specific weight.

Professor Marshall said he did not know that his opinion on the matter would be of any weight, but he thought that a great deal of discretion was required in comparing different curves. He did not know whether there was any method of measuring the importance attached to them sufficiently definite to make it worth while to have a standard mode of representation. With reference to prices, of course the importance of a change in the price of corn

was much greater, to take the old standard joke, than a change in the price of pepper which some statisticians had added to the price of corn. He did not know that it was possible in the graphic method to take any account of that, except perhaps by choosing different colours or different thicknesses of lines for curves of the first, second, and third order of importance; but he could not see his way to making more than a very rough classification. With reference to the remarks of Dr. Longstaff, he might state that he quite recognised the importance of the method of representing percentages, and he had alluded to it in his paper. He had employed the method himself. It was essential, however, to have absolute quantities. The method of representing curves on the plan advocated by Mr. Jevons had an enormous advantage; more than the percentages in some ways, though less in others. He thought they should have the absolute amount, and the percentages might be added afterwards where it was important to have them.

The meeting adjourned at 5.25 p.m. until the following day at 11 a.m.

The Jubilee Dinner.

The Jubilee Dinner of the Society took place at the "Criterion," Piccadilly, Sir Rawson W. Rawson, President, in the Chair. The company numbered about 126, including the following visitors and Fellows of the Society:—

VISITORS.

Argyropoulos, M. G. A.
Bertillon, Dr. Jacques, Hon. Member.
Bertillon, M. Adolphe.
Bodio, M. Luigi, Hon. Member.
Bourgeois, M. Léon.
Boutourline, Colonel S. de.
Chervin, Dr. Arthur, Hon. Member.
Erben, Professor.
Foville, M. Alfred de.
Hennequin, M. F.
Hunfalvy, Dr. Jean.
Inama-Sternegg, Dr. von.
Juglar, M. Clement, Hon. Member.
Kaufmann, M. H.
Keleti, M. Charles, Hon. Member.
Kiaer, M. A. N., Hon. Member.
Körösi, M. Joseph.
Levasseur, M. Emile, Hon. Member.
Liagre, General J.
Liegéard, M. A.
Loua, M. Toussaint.
Malarce, M. A. de.
McDonnell, Mr. James.*
Montgomery, Mr. Robert.†
Neumann-Spallart, Professor F. X. von, Hon. Member.
Perozzo, M. Luigi.
Robÿns, M. Jules.
Troinitsky, M. Nicolas.
Verschuer, Baron von.
Walker, Gen. Francis A., Hon. Member.

FELLOWS.

Aitchison, Mr. W. J.
Alexander, Mr. L. L.
Bailey, Mr. A. H.
Balfour, Dr. T. Graham.
Bateman, Mr. A. E.
Beaufort, Mr. W. M.
Begg, Mr. Alexander.
Bell, Mr. James T.
Booth, Mr. Charles.
Bourne, Mr. Stephen.
Bowley, Mr. E.
Breckon, Mr. J. R.
Caird, Sir James, K.C.B.
Chadwick, Mr. E., C.B.
Chadwick, Mr. J. O.
Chisholm, Mr. D.
Cohen, Mr. L. L.
Cork, Mr. Nathaniel.
Craigie, Major P. G.
Czarnikow, Mr. C.
Davies, Mr. W. H.
Debenham, Mr. F.
Del Mar, Mr.
Fitzmaurice, Lord Edmond.
Fowler, Mr. W., M.P.
Garnett, Mr. F. B.
Giffen, Mr. Robert.
Grimshaw, Mr. T. W.
Hancock, Mr. Charles.
Harvey, Mr. A. S.
Hendriks, Mr. F.
Heywood, Mr. James, F.R.S.
Hooper, Mr. Wynnard.
Hooper, Mr. G. N.
Howell, Mr. G.
Janson, Mr. F. H.
Keltie, Mr. J. S.
Lawson, Mr. Robert, LL.D.
Lee, Mr. Henry, M.P.
Lee, Mr. William.
Leete, Mr. J.
Shaw-Lefevre, Rt. Hon. G. J., M.P.
Levi, Professor Leone.
Lines, Mr. W. E.
Macpherson, Mr. H. M.
Martin, Mr. J. B.
Martin, Mr. R. B., M.P.
Mathieson, Mr. F. C.
Meikle, Mr. J.
Mouat, Surgeon-General, V.C.
Murray, Mr. K. B.
Newton, Mr. J.
Oppenheim, Mr. H.
Paul, Mr. H. M.
Pierrard, Mr. Paul.
Pitman, Mr. W. H.
Pochin, Mr. H. D.
President of the Institute of Chemistry.
Price-Williams, Mr. R.
Raphael, Mr. A.
Ravenstein, Mr. E. G.
Rawson, Sir R. W., K.C.M.G. (*Chairman*).
Reed, Mr. T. A.
Sherwin, Mr. J. H.
Seyd, Mr. R.
Sidgwick, Professor H.
Stack, Mr. T. N.
Stanley of Alderney, Lord.
Turnbull, Mr. A.
Turnbull, Mr.
Underdown, Mr. R. G.
Willans, Mr. J. W.
Whittall, Mr. J.

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* President of the Statistical Society of Ireland, Hon. Member.
† President of the Manchester Statistical Society, Hon. Member.

The CHAIRMAN: Gentlemen, I rise to propose the health of our Sovereign Lady the Queen. (Cheers.) In less than two years from this time Her Majesty's subjects throughout the globe will be celebrating the Jubilee of her reign. (Cheers.) For us it needs no stimulus of an anniversary to draw forth (as it would do in any assembly of Englishmen) the expression of our sentiments of loyalty and devotion to a sovereign so gracious, so good, and so wise, who for nearly half a century has led her people through perhaps the most eventful period of the world's history, and certainly the most important and the most exciting. In this expression I feel confident that I shall receive the most cordial sympathy of our visitors, who have done us the honour of being present to-day. We Englishmen have no monopoly of the admiration which the personal virtues of our Queen, her conspicuous virtues, her bright example, her womanly sympathy, have won for her throughout all nations. We are situated to-day in the centre of what I may call a political cyclone. (Laughter.) A few hours since I might have aptly described it as a circular storm. Why then are we sitting here so comfortably at this festive board discussing science and cultivating friendships, wholly unaffected by the heated political atmosphere which surrounds us, unmoved by the peals of party thunder which break with such startling rapidity upon our ears? Why is it? Gentlemen, it can be said in a few words. Our eyes are fixed with a loyal and inalienable attachment upon that Crown to which we look up, and which we see unmoved and immovable in this hurly-burly of politics, and because we are bound by a spontaneous and unalterable devotion to that peerless sovereign who wears it. (Cheers.) I propose to you to drink with all cordiality the health of our Queen.

The Right Hon. J. G. SHAW-LEFEVRE, M.P., Postmaster-General: Sir Rawson Rawson and Gentlemen—With your permission, as a former President of this Association, I have to propose to you the next toast, namely, that of "The Statistical Society," coupled with the name of His Royal Highness the Prince of Wales, our Honorary President. I am sure we all of us recognise the great ability, tact, and energy with which His Royal Highness always performs those many duties which are imposed upon him in his high station. We are also glad to recognise that His Royal Highness feels increasing interest in the great social questions that affect the interests of the people of this country, and especially of the working classes. It is in view of this interest that he has lately taken part in the long and laborious inquiry of the Royal Commission on the housing of the labouring poor in the three countries. His Royal Highness has not merely entered upon this inquiry as a theorist, but he has practised what he is about to preach. His own property in Norfolk, when it first came into his hands, was in the most neglected state, and was one of the worst properties in that part of the country in regard to the housing of the labourers upon it; but it is at the present moment, thanks to His Royal Highness, a model of everything which should be done by an intelligent and philanthropic landlord. With regard to the Statistical Society, I am sure we

are all proud of the work which it has performed during the past fifty years, under the able presidency in former times of statesmen such as Lord Russell, Mr. Gladstone, and Lord Derby; and more recently under the presidency of such able economists as Dr. Guy, Sir James Caird, Mr. Giffen, and others whom I might mention. When we look back at our own fifty volumes of addresses, papers, and masses of statistics, many of us may be almost appalled, and perhaps feel that the whole field is exhausted, and that nothing remains for present or future inquiry. But this is in fact very far from being the case. Fresh fields of inquiry are always being opened, new subjects are developed, new questions arise, old heresies and fallacies are constantly appearing in the field again like weeds, which require to be dealt with in a new manner. Now I think there are few present to-night who value more highly than I do the work of the Society, or who have more frequently made use of the statistical method than I have done when I have ventured to address myself to social or economic subjects. Having this feeling, and differing somewhat I believe from many of those around me, and from some of the most distingnished foreigners on the subject, I have still ventured to doubt whether the statistical method can be rightly called a science. It appears to me that statistics may be more properly called an art than a science. Its method is in fact the necessary implement of many sciences, and especially of political economy and sociology; it is a necessary adjunct of science rather than itself a science. But not less is it valuable and necessary, especially in the comprehension of and dealing with many of the phenomena of nature around us. There is another remark also that I would make with reference to statistics, viz., that valuable as they are in the hands of those who know how to use them, they are subject to misuse and abuse by those who do not. I do not know any fallacies that are more dangerous, subtle, plausible, and specious than those which are wrapped up in the statistical form. Speaking as a politician, and as a member of the legislature, I am conscious of the more frequent use from day to day and from year to year of the statistical method, but I am still more conscious of the abuse of this method which often takes place by politicians who are in search of arguments. Another quality of statistics is one which I have no doubt many of you have often observed: I refer to the ready way in which they lend themselves almost unconsciously to preconceived theories of all kinds. There is something in statistical figures that gives them a kind of vitality, so that they arrange themselves in groups and averages in order to suit any wishes and views that one might have; and notwithstanding one's ardent wish to be fair and to make a proper use of them, one finds sometimes that they elude one and group themselves according to one's preconceived views. In fact, the use of statistics sometimes reminds me of the toy known as the kaleidoscope, in which a number of little bits of glass arrange themselves in a beautiful geometric form; but a very slight turn of the instrument will group them into some other form totally different but equally beautiful. So it is with statistics. I have no doubt that it is on this account that we often hear it

said that statistics can prove anything. In the hands certainly of many of the gentlemen that I have alluded to who are not familiar with the proper use of statistics, I have no doubt they can be made use of in this way. It is on this account that it appears to me to be of importance that they should be the subject of study by a Society like this and kindred societies all over the continent, where there are men fully determined to deal with these important subjects in a spirit of fairness and impartiality, and with the sole desire to discover the origin of the phenomena that we see about us. The questions before us which can be dealt with by the statistical method are numerous, perhaps more numerous than ever before; questions such as, what is the cause of the great depression of trade which is visible in every part of the world at the present moment? What is the true cause of the fall in the prices of almost all the principal products of the world? What is the cause of that remarkable increase in the average duration of life observable in this country? What is the cause of the great differences of vital statistics in different countries? And if we go somewhat further afield, there is the still wider question alluded to by Mr. Giffen in his able paper read before us to-day—the question, What is to be the future progress of this country? Whether its vast population and its great accumulation of wealth are to go on in an ever-increasing ratio; and what also is to be the future of the great metropolis in which we find ourselves. Is it to increase at the same rate as hitherto? and if so, how is its great population to be provided for? These appear to me to be some of the many questions which may be dealt with and perhaps solved by the statistical method; and for the purpose of dealing with these great questions, and possibly of solving them, we have in this Society a body of trained experts determined if they can to deal with them in a truly philosophic spirit. It is on that account, gentlemen, that I venture to hope that this Society may continue to flourish as it has done in the past, and that it may be equally productive of great work in the future as it has been during the fifty years of its existence.

Mr. Robert Giffen: Sir Rawson Rawson and Gentlemen—I feel it a great honour indeed to have to propose the toast which the Committee of the Jubilee have been good enough to put into my hands: "International Statistics." It seems to me that at a meeting like this, where we are so much indebted to foreign gentlemen who have come to us to give us the benefit of their presence, and some of them to give us the benefit of their assistance in reading papers and in the discussion, it is a great honour to have this toast to propose. Whatever questions there may be as to the uses of international statistics, there can be no doubt that the intercourse to which meetings like this give rise, and the occasion of which is nothing else than international statistics, is a subject of congratulation to us all. Speaking for myself, I may say that nine years ago, at the Statistical Congress at Buda-Pest, I had the privilege of making the acquaintance of many of our foreign friends, and, apart from the pleasure, very

few things did me more good in the study of statistics than the fact of being present at that meeting and becoming acquainted with so many persons who were engaged in the common study, many of whom had had years of experience, and all of whom had a great deal to contribute to one's knowledge and information. I am sure that any of us who have had the privilege of being at those congresses must recognise that nothing can be more useful and pleasant than scientific gatherings where people meet to exchange views about a common subject, and to throw light upon the different problems on which they are engaged. We have the pleasure of receiving to-night M. Keleti, Chief of the Statistical Bureau of Buda-Pest, a name that can only be mentioned with respect, and which I have the more pleasure in mentioning, as M. Keleti was the leader of the Congress in 1876 which I have referred to, the last which has been held, and the success of which he did so much to promote. And there are other eminent names whom we must mention with respect in connection with those congresses. Dr. Engel is, I understand, hardly able to be present among us, but he has done great service in the way of statistics. One remembers also Dr. Ficker, of Vienna. I am sorry that I was not able to be present at those earlier congresses at which M. Quetelet was present. But it really is a great privilege to have had the opportunity of meeting with so many of these eminent men, and deriving lessons from their experience. To-night we have the privilege of receiving very many eminent statisticians of the Continent. I ought not to mention names so as to discriminate where all are so eminent; but I may be excused on personal grounds for mentioning one or two names of gentlemen who were eminent nine years ago, and whom I then looked up to with very great respect: men like M. Levasseur, of Paris, whom we receive to-night, and Signor Bodio, from Rome, whom we also have the pleasure of receiving. It is a great privilege indeed to us that we are able to receive these gentlemen among us, and to return in some measure the very great kindness that they have extended to English statisticians on their visits to the Continent. But to come a little to the subject, apart from personal questions, I should like to say a few words that may seem to be by way of anticipating the discussion that we are to have to-morrow, though I do not think that what I can say to-night will really anticipate in any measure the very able paper which we are to receive to-morrow from Professor von Neumann-Spallart. Statistics are nothing if they are not international. It seems to me that human nature being what it is, and the subject of statistics being so much connected with human nature, it is impossible but that the facts and experience of different countries must be mutually serviceable. In regard for example to statistics of births, deaths, and marriages, and the statistics of all sorts of economical questions, it is quite certain that the experience of one country or of one region must be useful everywhere. If the circumstances are not alike in every country and region, the differences are worthy of explanation and understanding. Therefore I repeat that statistics are nothing if they are not international. There is another reason, it seems to

me, why the importance of international statistics is so great, and it is this, that one of the main purposes of statistics is to describe the existence of mankind in societies, to describe different types of societies, and to compare them with each other. You wish to describe great groups of people in their main aspects, and it is important for that purpose that you should be able to take the history of one country and compare its condition at different times; but if you can not only do that, but compare the country at a given time with others, and compare all countries at different times in the progress of history, you obtain a much better knowledge of the subject than you could possibly have if you had only one nation or one group of nations before you. I think, therefore, that the toast I have to propose is a very important one; it is one in which we must all concur; and I have to propose in connection with it the health of a very distinguished foreign gentleman who is among us, whose acquaintance I believe I had not the pleasure of making at Budapest, but whom I afterwards met in Paris on a similar occasion. I refer to Professor von Neumann-Spallart, a member of the Imperial Central Statistical Commission of Vienna, and a very distinguished writer on statistics. There is a certain fitness in coupling the name of Professor Spallart with this toast, because he has undertaken to give us to-morrow an account of the substantial work which the different International Statistical Congresses have done. In that paper I have no doubt that he will make suggestions of very great importance with reference to this question of international statistics. I should like to add also that we recognise in the work which he has already accomplished that he has done not a little to show the great value of these general comparisons between different nations. I do not remember the exact title of his publication, the well-known "Uebersichten;" but the account which he presents of the circumstances of the world, the trade of the world in different years, and the regular progress in different trades, is so important, that there is a certain fitness in our coupling with this toast the health of Professor von Neumann-Spallart.

Professor von Neumann-Spallart in responding, said he must humbly decline to accept the flattering words which Mr. Giffen had spoken respecting him, but he would take the opportunity of saying a few words with regard to international statistics. The subject could not have been better introduced than it had been by Mr. Giffen, whose authority was indeed a sufficient reason for the formation of an International Statistical Association. What he (Professor Spallart) would have to say in his paper on the following morning would be very feeble in comparison with the statements of Mr. Giffen. In regard to the association proposed to be founded, it would present three characteristics: it would have first an international character; secondly, the character of association; and thirdly, the character of hospitality. It would be international, because it would concern itself with the statistics of all countries; and where could that international character be exhibited better than in Great Britain, whose influence was so widespread through-

out the world? With regard to the associative character of the institution, he might be permitted to refer to a pamphlet written more than fifty years ago by a German, who advised his countrymen to study the idea of association in England, and who made certain inquiries in regard to the associations in this country with a view of obtaining some lessons as to what should be done in Germany and Austria. He was assisted by two gentlemen, an old gentleman and a young one, and the name of the young gentleman was Rawson W. Rawson. If the President had any doubt upon the subject, he would hand him the pamphlet to which he had alluded, where he would see his name duly recorded as Herr Rawson of the Board of Trade. In regard to the characteristic of hospitality, of course the International Statistical Association would be going all over the world, meeting in Rome, Milan, Paris, Vienna, and elsewhere, and a good deal of the pleasure of the members would depend upon the hospitality accorded to them in the places which they visited; but nowhere could they find a better centre of hospitality than they had found in London and in Great Britain.

Sir James Caird, C.B.: Mr. President and Gentlemen—I have been called upon at very short notice to offer to your acceptance a toast which I am sure requires very little recommendation on my part. It is the toast of "Our Sister Societies," coupled with the name of the Statistical Society of Paris. My friend Mr. Giffen has so ably discoursed upon the advantage of international statistics, that I need not take up your time by following him upon that point. I was, however, a little struck with what fell from my right honourable friend, a former President of this Society, Mr. Shaw-Lefevre, in regard to the Statistical Society not being a scientific society. I do not wish to enter upon an argument with my right honourable friend, for I know I should have little chance of success with him, but I will venture to say that accuracy in the observation of facts and in the collection of facts is the very foundation of science, and in my view societies which like our own are engaged in the observation and collection of facts, are doing an important work towards the scientific application of those facts. In reference to matters with which I am more intimately acquainted, I may be permitted to refer to the extraordinary ability and research displayed in the United States of America in reference to the collection of agricultural facts. From month to month we in this country receive important information which guides us in our markets, on our farms, and in many other ways that our friends across the Atlantic can hardly imagine. I should be glad if the agricultural department which has been lately established in this country would endeavour to follow in the footsteps of our friends and competitors across the Atlantic in their useful and practical mode of collecting and commenting on their agricultural prospects. As to sister societies, we as representing statistical experience in this country have the greatest satisfaction in finding that our Jubilee has been attended by so many distinguished men from all parts of the Continent and from

America. We give them a hearty welcome, and in the name of the Statistical Society of London I now beg to propose "Our Sister Societies," coupled with the name of the Statistical Society of Paris.

M. Emile Levasseur, in acknowledging the toast, said that Sir James Caird had very properly alluded to the Statistical Societies of London and Paris as two sisters. The London Society was the elder sister, the Paris Society being so much younger that it might be almost called a daughter instead of a sister; but whether the relationship was that of daughter or sister, the two societies were certainly of the same family, and each had the same object in view. The question had been raised whether the subject of statistics might be regarded as a science or an art. However the question might be answered, the members of the Statistical Society might be regarded as savants, and the Society itself was a scientific one. They studied the processes of science, and entered into the investigation of social facts. If they did not study science itself, they held in their hands the key of many social sciences, and were able to open many doors that would otherwise be closed. The questions of population and demography were essentially connected with statistics, and in investigating those subjects they were in reality savants. For a savant was a man who uses scientific methods in a serious spirit, just as an orator (according to Cicero's saying, cited by M. de Foville) was an honest man who knew how to speak. Their studies were very diverse, and it was therefore especially necessary that they should be united in their investigations. If union was desirable in regard to other branches of science, it was especially so in regard to statistics. He begged to thank the Statistical Society of London for the hospitality extended to its visitors, and hoped that many other opportunities would be afforded for similar re-unions.

Lord Edmond Fitzmaurice, M.P., Under Secretary of State for Foreign Affairs: Sir Rawson Rawson and Gentlemen—I rise to submit to your approbation a toast which I feel, in speaking to an English community, needs but very few words. I beg to propose "The Health of our Foreign Visitors." Speaking as a Fellow of the Statistical Society, I feel that we are all greatly pleased and greatly favoured by seeing so numerous a gathering of distinguished foreigners attending the present meetings. We rejoice to see nearly every country of importance represented—admirably represented by men of European and international fame. We rejoice that France sends us men fully able to maintain that reputation for clearness and lucidity of thought and expression which has always been the distinguishing characteristic of her literature. We rejoice to see so strong a delegation from the empire kingdom of Austria - Hungary, representing on this occasion, in the absence of any special delegate from Germany, not only themselves, but also the solid thought, the laborious aptitudes, which have always distinguished the German nation amongst all the nations of the earth. We have also eminent representatives

from Russia and Italy; we rejoice that the minor nations of Europe are well represented, because we know how important it is to them, quite as much so as to the greater nations—that statistical information should be spread. We rejoice to see that America has sent us one whose name is familiar wherever statistics are studied. We are glad to see, also, that the Southern Continent of America does not lack a representative in this international gathering. Well, gentlemen, this being so, we naturally ask you who are the English members of the Statistical Society of London to welcome our foreign guests among us by drinking their health. It is the habit of Englishmen to do so, to show by an open and friendly sign how glad we are to see these distinguished gentlemen amongst us. Mr. Shaw-Lefevre in his observations has pointed out the very great opportunities which this city of London affords to foreign visitors for the study of statistical science. How many questions there are which at this moment are almost burning questions—questions of politics, or having at least a political side, such as the government of London, which after all must have a statistical basis, if they are to find a satisfactory and sound solution. But there is one consideration that I might point out to our foreign guests to show how very anxious we have been to do everything we could for their pleasure, their interest, and their amusement. Much has been said about a recent ministerial crisis. Now let me assure our foreign visitors that this ministerial crisis has been entirely arranged for their happiness and delectation. There has been a good deal of discussion of late as to why this ministerial crisis took place, but no one has hitherto had the courage to state the true reason. It was entirely arranged for the entertainment of the foreign guests of the Statistical Society. Her Majesty's Government had observed through those agents connected with the office that I either do or do not represent at this moment, I do not know which, that there had recently been a ministerial crisis in France, and from such information as we were able to receive we thought it likely (and our information turned out to be quite correct) that there would soon be a ministerial crisis in Italy and in Spain. Well, we thought under those circumstances it was our duty to arrange a ministerial crisis in England; and I can assure M. Levasseur that I for one shall be very much disappointed if shortly after his return to France I do not receive from him a paper or pamphlet of some kind, containing a "critique comparée des crises ministerielles en France, en Angleterre, en Espagne, et en Italie." I am afraid that I have already trespassed too long on your attention, and I shall therefore simply ask you to drink, as I am sure you will, with all heartiness, "the health of our distinguished foreign visitors."

M. G. A. Argyropoulos, Chargé d'Affaires of the kingdom of Greece: begged to thank Lord Edmond Fitzmaurice and the members of the Statistical Society generally for the cordial and graceful manner in which the toast had been proposed and received. He did not feel called upon to say anything with regard to the subject of statistics, because unhappily he was not a savant like many of

those around him, although in the course of his career he was obliged to refer to statistical tables, which were so interesting and useful in the different countries which some of them had to visit in obedience to the orders of their Governments. He was sorry to say that he should soon have to leave England, but he should never forget the cordiality and hospitality with which he had been everywhere received in this country.

M. Troinitsky, Director of the Statistical Commission, St. Petersburg; Delegate of the Russian Government: also acknowledged the toast, and expressed his great interest in the work of the Statistical Society, and in the establishment of the International Association about to be established.

M. Keleti, Chief of the Royal Statistical Bureau, Buda-Pest; Delegate of the Austro-Hungarian Government: also expressed his concurence in the establishment of an International Statistical Association, of which he said he should be glad to become a member, and thanked his friends in England for their generous hospitality during his visit.

M. Bodio, Director-General of the Statistical Department, Rome, spoke as follows:—M. le Président, Messieurs! Les Anglais aiment s'appeler eux-mêmes les Romains d'aujourd'hui. Ils ont plusieurs titres à cela. La puissance, la richesse des Anglais, leur génie de colonisation, leur science de gouverner les peuples (auxquels ils laissent leurs mœurs, leurs lois, leurs religions, et jusqu'à leurs princes); l'esprit d'indépendance des Anglais et leur dévouement entier à la patrie, donnent bien à eux le droit de se considérer comme les successeurs des Romains. Gare à celui qui toucherait à un Anglais. Celui-ci est protégé partout et toujours par le prestige du nom de sujet Britannique: *Civis Romanus sum!* De son côté, Messieurs, le Rome du Tibre n'est pas morte. Elle a sommeillé pendant des siècles; elle vient de se réveiller. Ce n'est pas, d'ailleurs, parce qu'elle démolit des vieilles masures pour bâtir des maisons d'un goût artistique douteux; ce n'est pas (il s'en faut) parce qu'elle transperce les parcs de ses villas princières avec des rues flanquées de bâtisses vulgaires; ce n'est pas, non plus, parce qu'elle s'est accrue en peu d'années de cent mille habitants, qu'elle a bien mérité de la patrie. C'est pour avoir reconstruit l'université, pour avoir donné un nouvel élan aux études naturelles et sociales; c'est pour avoir remis la critique historique et le synthèse scientifique à la place de la foi dans le miracle (car jamais un miracle ne s'est produit sous le microscope du physiologiste); c'est par ces titres principalement que Rome affirme le droit d'être le capitale d'une nation de 30 millions d'habitants. Ainsi, Messieurs, la Rome du Tibre à la métropole actuelle du monde, Salut!

M. de Foville, Vice-President of the Statistical Society of Paris, &c., &c.; Delegate of the French Government: said he was quite sure he should be interpreting the unanimous sentiments of

all present in proposing the health of the then President of the Statistical Society. He (M. de Foville) had spoken in his paper read on the previous day of the enemies of statistics. Sir Rawson Rawson was one of the greatest friends of statistics, ever active and ever practical. England was not the only country that knew with what success he had fulfilled his important functions in various parts of the world. Foreigners equally with Englishmen were familiar with his labours, and the foreign visitors therefore cordially united in drinking his health. Sir Rawson had accepted the hospitality of his friends during his too short visit to Paris, and now the French visitors were receiving in return a far more sincere and affectionate greeting and entertainment, for which he desired to return his heartfelt thanks. In the person of Sir Rawson Rawson he saluted the personification of English science and hospitality.

The President: Gentlemen—It is not always that a speaker rises with pleasure to address an assembly, particularly one who, although he has filled many public offices, cannot pretend to be a public speaker. I confess that I rise with pleasure to-day, not so much to thank M. de Foville for the personal compliment he has paid me, as to speak in the name of the Statistical Society of London, of which, by a happy accident, it has fallen to my lot to be President this year, and to thank Mr. Shaw-Lefevre for his kind words in proposing the toast of H.R.H. the Prince of Wales, our Honorary President, and the prosperity of the Society; also to thank those of our foreign friends who have been kind enough to follow Mr. Shaw-Lefevre in the expression of that wish. I desire also to thank the Statistical Society of Paris, its distinguished President, M. Leon Say, and all those gentlemen whose acquaintance I had the pleasure of making during my visit there, when I received a most cordial welcome as the representative of the Statistical Society of London. For myself I scarcely feel worthy of the kind words spoken by M. de Foville. I was certainly an early labourer in the field, a sort of bricklayer; and now, after a long interval of nearly forty years, I come amongst you and find myself in the company of skilled architects, an unworthy member of the Council of this Society, except for the fact that no member feels greater zeal and a stronger interest than I do in the Society's welfare. I should be glad to take this opportunity of saying a word in regard to a toast that has been given to-day. The subject is too important to be treated at this late hour; to-morrow it will occupy our exclusive attention. I refer to the question of international statistics. The subject of international statistics has enemies other than those of which M. de Foville spoke so gracefully and so amusingly yesterday. Some people appear to dislike the name of international statistics, to be in some way afraid of them. They seem to think that we who are interested in this subject want to make a suit of clothes that shall fit everybody, the giant of Russia and the dwarf of Monaco, and that we want everybody to cut their clothes according to our fancy. Now that is not what we aim at. We want to make a suit of clothes to fit ourselves, and we wish to learn from

others how to make it in the best possible way. We wish to disport ourselves in Rotten Row, in the Champs Elysées, on the Prater, and even Unter den Linden, in the best cut and best fitting suit; and we want to get information from the neighbouring tailors' shops that will enable us to accomplish this object of our ambition. We believe that if we can make a good suit to fit ourselves, other people who also like to wear a good suit will say, "How did you make that suit? We should like to make one of the same kind." Let us make comparisons and work together in this way, and between us we shall make clothes which, though they may be of different sizes and even different shapes, will be of the same good material, made up in the same good fashion, and fit us in the best possible manner. In like manner I hope that those who have met here will unite in establishing an International Association which shall lay the foundation of a useful comparison of important facts for the benefit of all who are willing to learn. My idea is that we should be willing to learn from all who are willing to teach us, and we should be willing to teach all who are willing to learn from us. That is my idea of an International Association. I hope you will excuse me for thus touching upon a topic which is outside the subject of M. de Foville's toast. I will only say further on that subject that I feel on the part of the Society grateful to our foreign members who have done us the honour of coming amongst us, and to our own Fellows who have come forward in such numbers to support us. I trust that our meeting this year will be very beneficial to the Society, showing what it is really doing, and that it is esteemed not only amongst our own countrymen, but amongst foreigners the most competent to judge of its merits. I sincerely hope that this Jubilee year will be the commencement of a new series of useful and important years for the Society. With regard to myself, I thank you heartily for the honour you have done me in drinking my health.

Wednesday, 24th June. *Third Day.*

Theatre of the University of London, Burlington Gardens.

Sir Rawson W. Rawson, K.C.M.G., C.B., President, took the Chair at 11 a.m., and called on Professor von Neumann-Spallart to read his Paper.

Résumé *of the* Results *of the* International Statistical Congresses *and* Sketch *of* Proposed Plan *of an* International Statistical Association.

By Professor F. X. Von Neumann-Spallart.

CONTENTS:

General Introduction.

The President of the Statistical Society has done me the honour of inviting me to draw up a *résumé* of the results of the various International Statistical Congresses, and to express my views on the practicability of the formation of an International Statistical Association. It is with the greatest pleasure that I have undertaken this task, and I am the more encouraged to do so, because I am convinced that much material benefit will accrue from the discussion which will take place on this subject, and in which the most distinguished statisticians, not only of England but of the world, now present will take part. The conclusions arrived at by this meeting will tend considerably to supplement our views and suggestions, and they will also mark a new era in the history of Statistics. I hope that the Jubilee of the most important Statistical Society of Europe will not only represent the "Golden Wedding," if I may so term it, or happy union between learned and distinguished English statisticians, but will also form a link connecting more closely statisticians throughout the whole of the civilised world.

A glance at the past history of statistics, and a superficial examination of the origin of all statistical observations, are sufficient to prove conclusively to us that in the region of statistics isolation means nothing, whilst association means everything. The naturalist is in the enviable position of being enabled, without the least

extraneous aid, to carry out the most important investigations. The astronomer in his observatory, the chemist in his laboratory, the physiologist dissecting the body to investigate its mechanism, all can obtain without extraneous help the most valuable scientific results. The statistician, on the contrary, alone and unaided can do nothing. Observations concerning the state and movement of the population, the laws of births, deaths, and average life considered in the light of the influence exerted upon them by the different conditions of political and social life, the ebb and flow of economic prosperity regarded under the same conditions, the study of the different moral phenomena manifesting themselves in the midst of human society; all these questions constitute a sphere of investigation and special study entirely independent of the domain of the physiologist, the psychologist, and the historian. The statistician expresses the result of his observations numerically, and requires the assistance of an army of observers who undertake in a similar manner to record the condition and changes of social phenomena. Thus it will be apparent that however valuable or desirable the co-operation of observant statisticians in one particular country may be, it becomes infinitely more so when it is extended throughout the world.

M. Quetelet, who so successfully directed his great abilities to the application of mathematical science to the "*corps social*," has taught us that the discovery of its governing laws can only be approached by the accumulation and reduction of statistical facts. M. Quetelet says it is the social condition of mankind as exhibited by these facts which forms the chief object of the study and investigation undertaken by Statistical Congresses generally, and it is difficult to believe that any Government can long refuse to recognise the value and importance of international observations. Without similarity, nay congruity of the methods employed, comparisons of the different classes of facts under different local conditions and at different times are practically worthless, and it is the special task of Statistical Congresses to produce this assimilation.

The opinion has been very generally expressed by many distinguished statisticians that the widening of the field of observation is not always desirable, but that on the contrary the aggregate observations are more clearly brought out by narrowing this area. If this assumption be correct, we must relinquish all idea of establishing an International Statistical Association, and be content with the perfection of the official statistics of each country. The assumption, however, is a false one, as it is clearly based on a misapprehension. Taking human society as a whole, it is at once apparent that every country has its own peculiar characteristics, its *type* in fact, which would be at once destroyed if we mixed up

indiscriminately all the data of observations. The type of an individual country only becomes measurable and capable of numerical expression when compared with that of another; it is with this object therefore that we endeavour by means of international statistics to preserve the knowledge of the unit as well as to obtain a knowledge of the aggregate, and we hope by these means to arrive at the actual causes and laws of social and political phenomena. For example, how would it be possible to arrive at an accurate idea of the birth-rate, mortality, or producing power of each country? We are only able to obtain a knowledge of these important facts by comparing them one with another and with the aggregate of all countries, and by comparison we can estimate the various causes influencing them.

Again, in another manner international statistics appear as the foundation of scientific and administrative progress. The boundaries of nations are only in a few cases natural ones; for the most part they are fixed by political or other reasons, and therefore the similarity in the conditions of national life, and the ethnographical conditions of nations, are often carried beyond the actual boundaries of one country into another; and if therefore it is desirable to examine their influence closely, or to arrive at the results of accurate statistical analyses, we can only obtain the materials by a comparison of international statistics. It is then at once apparent that from this point of view alone every extension of the field of observation is of inestimable value. It is only in the largest number of observations that the governing law becomes apparent, and the truth becomes more and more to be relied upon as the number of facts accurately noted, which form the basis of its elucidation, becomes larger; and it is consequently of the highest importance that observations identical in character should embrace the largest field attainable. It is not enough to collect the statistical facts of one class over the greatest area and to the fullest amount, but a simultaneous collection of the greatest variety of facts should be made, such as the statistics of the increase of the population, of marriages, births, and deaths, of emigration, crime, education, and occupation, of the products of agriculture, mining, and manufacture, of the results of trade, commerce, and finance; and to this end nothing contributes more than the establishment of international statistics.

I trust that I have sufficiently explained away any objection that may be raised against international statistics, as I am convinced that the deepest obligations are owed to them, and that it is the duty of every true statistician to promote and further them, to the utmost. My remarks are, of course, not directed to my brother statisticians now assembled in London, as it is not necessary for me to point out to them the extreme importance of Statistical

Congresses, and their useful fields of labour: they are already fully alive to them. It is however my duty, in a few words, to draw their attention to the fact that all those who by their absence would appear to hold a contrary opinion, and who have for some time past evinced a disposition to hold aloof from these meetings, fail in their duty as true statisticians. Our endeavours appear to me to be so clearly in the interests of science, and to the improvement and perfection of official statistics, that by reason of their lofty aim alone they ought to meet with universal approval and encouragement.

And now I may perhaps be permitted to review the history of past Statistical Congresses and their results, and to base upon them my suggestions and proposals for the continuance of similar work.

Historical Sketch of the International Statistical Congresses.

It appears to me to be a favourable omen that in the same city at which, thirty-four years ago, the seeds of the first international union were sown, proposals for a revival should be mooted. Quetelet, to whose invaluable services to statistical science we cannot pay too high a tribute of praise, says in the "Bulletin de "la Commission Centrale de Statistique," Tome vi, p. 3: "*Ce fut à* "*Londres pendant l'Exposition Universelle, qu'eurent lieu les premiers* "*entretiens sur la possibilité de la réalisation d'une idée, qui ne laissait* "*pas que de presenter des difficultés d'exécution. Forts de l'assenti-* "*ments de plusieurs savants Anglais, Français, Allemands, et même* "*Americains, les auteurs de la proposition n'hésitèrent pas à y donner* "*suite.*"

The Central Statistical Commission of Belgium decided at London, in 1851, to hold a Statistical Congress after the International Exhibition; but political reasons caused this Congress, which was fixed for the autumn of 1852, to be postponed, and it was not until the year 1853 that it eventually met at *Brussels*, and held its sittings from the 19th to the 22nd of September. The very favourable auspices under which this Congress was opened enabled Quetelet to foresee the valuable results which would accrue from the development of our knowledge of the conditions of social life. In his opening speech, and again in a later one, Quetelet pointed out to the members the extreme importance of the Congress, and the valuable results that would accrue from the movement. He said:—

"*Ce Congrès, si je ne me trompe, commencera pour elle une ère* "*nouvelle. La statistique entre dans la même phase que plusieurs* "*autres sciences, ses sœurs ainées, qui ont apprécié comme elle le besoin* "*d'adopter une langue commune et d'introduire de l'unité et de l'en-* "*semble dans leurs recherches. Il y à quelques jours, Bruxelles voyait*

" *s'ouvrir un autre Congrès, ayant les mêmes tendances, le même objet* " *que le notre. Il s'agissait également de mettre les observateurs des* " *differents pays dans des rapports de bienvieillance, de leur proposer* " *des méthodes uniformes pour simplifier leurs travaux, et pour en rendre* " *les resultats comparables. Le but était l'étude des grandes courants* " *de l'atmosphère et des principales mers du globe, le nôtre n'est ni* " *moins vaste, ni moins relevé; il s'agit aussi d'étudier, dans un* " *autre ordre de choses, les fluctuations que présentent les sociétés* " *modernes, ainsi que leurs courants et leurs écueils. Puissions-nous* " *accomplir avec succès notre noble mission, et servir, nous aussi, la* " *cause de la science et celle de l'humanité.*"

Even though Quetelet's hopes were not entirely realised, it is nevertheless a fact that for a period extending over a quarter of a century the desire for the development of statistical research was stimulated by Statistical Congresses. Each of the nine different Congresses has produced good fruit in one direction or another, and although it may be urged that their power became somewhat enfeebled by repetition, and that they have in themselves somewhat degenerated, yet all of them have been productive of vast benefits to nations at large. It is in the nature of all such movements that the zeal of the members taking part in them is greater at the initiation; there was the charm of novelty, each one was impressed with the necessity of striving to do his utmost, and the problems that were submitted for solution were so complex, that the results of the first Congress stand relatively higher than any of a later period.

The first Congress had already laid the foundation of the whole future treatment of international statistics. On this point Quetelet observes:—

" *La session du Congrès général de statistique de* 1853 *est* " *convenue d'une entente entre les administrateurs et les savants des* " *divers pays, qui s'occupent de l'art difficile de recueillir des observa-* " *tions statistiques. Il est à espérer que les travaux qui appartiennent* " *à cette science seront dorénavant entrepris dans tous les États, d'après* " *les bases arrêtées au Congrès de Bruxelles. Ce n'est plus une voeu* " *théorique de voir les États adopter des bases uniformes pour les* " *travaux statistiques, afin de rendre comparable les résultats obtenus* " *dans différents lieux, la possibilité de réaliser cette idée a été* " *proclamée, les cadres ont été arrêtées et la lecture du compte rendu* " *montre ce qu'il est permis d'attendre de la sagesse de la maturité,* " *de la parfaite intélligence et de la bonne harmonie, qui ont présidé* " *aux délibérations du congrès.*"

The result of this Congress was the universal acknowledgment of the necessity of unifying, harmonising, and developing a comparable system of international statistics, and of carrying on

observations over the social aggregation of society. The interchange of publications, and the relations now existing between the various Statistical Bureaux, which are at present looked upon as matters of course, were established at this Congress. Formerly, communications between the different Statistical Bureaux were rare and exceptional, and nothing has done more to promote and foster the growth of the science of statistics than the facilities which were then established for a free and unfettered intercourse. Even during the first sitting of the Brussels Congress great stress was laid on the necessity of centralising official statistics, and the first stimulus was given to the improvement of agricultural statistics, which are now prepared in nearly all countries, and in perfecting statistics of industry, navigation, and trade.

The principle of the work initiated at Brussels was amplified by the Congresses which followed, each one thoroughly recognising the extreme importance of co-operation. It would be easy to obtain from the voluminous reports of each Congress the work that was undertaken, and the results that were obtained from them, but as my present audience includes many who are perfectly familiar with them, and who have themselves taken part in them, it will be unnecessary to do more than merely touch upon them, more especially as by going greatly into detail I should trepass too much upon your time and patience, and unduly enlarge the scope of the present paper. I will therefore confine myself to a short sketch of the most important of the labours of the following Congresses, and a brief review of some of the chief results.

At the *second* Statistical Congress held in *Paris* in 1855, the members adopted the resolutions passed at previous Congresses, and devoted considerable attention to the question of the centralisation of official statistics. At the suggestion of that eminent European statistician, my distinguished countryman, Baron De Czœrnig, the following resolution was passed: "That in every State a Statistical "Central Commission, or similar institution, be established, con-"sisting of representatives of the principal Government depart-"ments and other influential persons, who by reason of their "special qualifications are in a position to promote the growth of "the study of statistics, and to lend their assistance in the solution "of complex problems." The association of officialism and science, which is even at the present day a very desirable combination, was greatly advanced by this Congress. We are also indebted to it for the cultivation and development of a very important branch of statistics, viz., the statistics of large towns. On this point Dr. Engel in one of his works devotes no less than seventeen chapters, among the principal being Public Health, Consumption, Industry and Commerce, Municipal Organisation,

Budgets, Charities, and Friendly Societies. It was suggested at this Congress that statistical bureaux of the various towns and cities should issue publications, which should contain accurate and reliable statistical information on all points in connection with matters relating to the town or city whence issued. At Paris also uniform weights, measures, and moneys for all nations were specially recommended, as being essentially necessary to secure comparable international statistics, the metrical system being suggested as the most useful. Quetelet speaks as highly of the second Congress as he did of the first. He says: "*La partie sur* "*laquelle nous désirons plus particulièrement appeler l'attention, est la* "*concordance qu'il c'est établie dès la seconde réunion entre les* "*membres du congrès réuni à Bruxelles et les membres du congrès réuni* "*à Paris; il a été facile de reconnaître, dès ces deux premières ren-* "*contres, l'unité qui existait de l'une et de l'autre part. Les lois de la* "*nature peuvent être gênées, forcées même, mais elles ne s'effacent pas* "*quand on procède avec la fermeté et la certitude nécessaires, elles* "*se relévent toujours sous leurs formes premières.*"

At the *third* Congress, which was held at *Vienna* in 1857, the necessity of a closer union of the strictly departmental element as opposed to the continually increasiug number of laymen, and those taking no official part in the proceedings, was strongly insisted upon. It was resolved that the official representatives of the various Governments should form themselves into a special organising committee to decide as to the labours and the scope of the Congress, before the actual meeting. This *Avant Congrès* is the forerunner of the later International Permanent Commission, to which with certain modifications our proposals might be adapted, in the formation of an International Association. This Congress initiated many valuable reforms, to which statistics generally are more and more indebted each year. I might here refer to the fact that out of those elements which the natural history of statistics must supply in order to understand the physical condition of States and peoples, a basis was founded on which deductions might be drawn. These elements are the geological, hydrographical, and climatic properties, botanical, zoological, and cartographical representations, which were formerly as neglected in statistics as they were in history. They explain many natural phenomena, and after thirty years have become an integral part of descriptive statistics, and are now placed at the commencement of every good handbook and statistical manual.

I may also observe that ethnographical statistics, in which, owing to the valuable labours of Baron de Czœrnig, Austria has taken such a lead, received their first impetus at the Vienna Congress, and also that the first attempt at a universal classification of

industrial statistics was made. New tables for statistics of the means of communication and forms for statistics of trade were elaborated, and, finally, *questionnaires* were drawn up for transmission to foreign Statistical Bureaux for obtaining statistics of education, and of civil and criminal justice.

The *fourth* Congress was held in *London* in 1860, and was presided over by His Royal Highness the late Prince Consort, who was greatly in favour of a system of international statistics. It is only necessary for me to call attention to the excellent opening speech of the President to remove any lingering doubt that may exist as to the extreme importance of the union of Statistical Bureaux throughout the whole civilised world; but what Prince Albert then said seems, unfortunately, to have been quite forgotten during the last ten years, otherwise it would be impossible to realise that it is only to-day (since the meeting at Buda-Pest) that we are enabled, through the hospitality of England, to exchange our views on international statistics. The illustrious President said as follows: "*Mais toutes ces comparaisons de différentes classes de* "*faits dans différentes conditions locales et à différentes époques,* "*dépendent de la similarité, de la congruité même de la méthode* "*employée et des expressions, chiffres et conditions choisis sous* "*lesquels les observations ont été faites. Le monde en général ne doit* "*il pas les obligations les plus profondes à un congrès comme celui* "*devant lequel je parle, qui c'est donné pour tâche de produire cette* "*assimilation et de mettre à la disposition de l'homme, sur sa propre* "*condition, une accumulation d'expériences scientifiquement élaborées,* "*et réduites de manière à permettre à la plus mince intelligence de* "*tirer de conclusions sures.*"

When we reflect upon Prince Albert's words, it is difficult to understand the reasons that have led to the suspension of the meetings of these valuable Congresses which had commenced so auspiciously. In London, as in Vienna, considerable inconvenience was caused by the attendance of those who had no claim to be considered as statisticians. The illustrious President made no secret of the fact that the Congress was not a special assembly of deputies from different Governments met for important consultations, but that it partook of a national character by appealing to the public *en masse* and inviting its co-operation.

For all that we see from the published report of the Congress in question, excellent results produced by the labour of the organisation committee and its various sections, and I may mention the fact that considerable attention was paid to the question of rural economy and the mining industries, international banking statistics and credit institutions, returns relating to the latter now being so ably prepared in Italy under the direction of Mons. L. Bodio.

A comprehensive plan for the collection of sanitary statistics was elaborated, and a stimulus given to the compilation of judicial and financial statistics. We owe more particularly to the London Congress the improvement in the suggestion made at Brussels and Paris for a perfected system of elaborating the census returns, but the suggestions were eventually postponed till a subsequent Congress, and they were reconsidered at St. Petersburg in 1872, a full account of the same being given in Dr. Engel's "Compte Rendu "Général."

The *fifth* Congress, which was held at *Berlin* in 1863, was inaugurated under the most brilliant auspices, and Dr. Engel, one of the most eminent statisticians of the day, then Director of the Prussian Statistical Bureau, was selected as the executive officer of the organising commission. When we read his inaugural address we are again astounded that any one can be found to depreciate the value and importance of a system of international co-operation in statistics. He said that the Congresses hitherto, wherever they had been held, had never failed to receive the support and encouragement of scientific and administrative men, and from the highest to the lowest, all had united in bearing testimony to the extreme importance of the unification and harmonisation of a comparable system of international statistics. The feeling of enthusiasm among the members of the various Congresses was most marked, and that the Congresses themselves were recognised as productive of immense benefit to the nations at large was clearly evidenced by the fact that the meeting held in London in 1860 was presided over by one of the best and wisest princes of his own or of any time. If, therefore, Dr. Engel goes on to remark, the highest in the land did not withhold their patronage and co-operation from the Congress in London, at which forty foreign delegates were present, it was only fair to assume that at the Congress held in Berlin in 1863 the city would become the rendezvous not only of foreign delegates, but that Germany itself would be aroused with special energy to give *éclat* and efficiency to the work of the re-union. Quetelet also reports most favourably on the first ten years' experience of International Statistical Congresses, and bears a high testimony to the zeal of the members and attention paid by them to the business of the various meetings, and says that in his self-imposed task of compiling tables relating to international statistics of population, no less than twenty-three countries rendered him the most valuable assistance and the materials necessary for the completion of his labours.

At this Congress held in Berlin important resolutions were passed which had the effect of greatly stimulating the amplification of official statistics, and of increasing the interest universally

taken in statistical work generally. But notwithstanding the success which had hitherto attended the meetings, and particularly that held in Berlin, considerable doubt was expressed as to the future of Congresses generally, particularly by German statisticians. At this meeting the question of the statistics of real estate and the hypothecation or mortgage of the same was debated in one of the sections, and it is greatly to be deplored that this particular branch of statistics has not as yet made material progress in any country. Detailed forms were adopted for the quinquennial and annual returns of all classes of life insurance companies, and considerable attention was devoted to the subject of statistics of health, and of savings banks and other provident institutions, and many other subjects were discussed at great length, which had already been considered at previous Congresses.

The most important subject of a plan for the permanent organisation of the International Statistical Congress excited lively interest, and elicited a warm discussion, and a detailed scheme was proposed by Dr. Engel, which was however postponed for final consideration and action to a subsequent meeting. An extraordinary special committee was appointed on this subject. Dr. Engel, by reason of his practical experience, his keen perception, and his great personality, was eminently qualified to deal with this subject, and he formulated certain propositions which were embodied in a statute book, regarded even at the present day as a most valuable work. He very clearly pointed out that the original object of these Congresses was the unification and harmonisation of a comparable system of international statistics, and in a great number of cases this object had been attained, in others it has yet to be attained. Again, he shows that the results of Statistical Congresses are not confined solely to securing a universal system and uniformity of statistical data for purposes of international comparisons, but they render valuable assistance in solving many abstruse problems and elucidating many questions of great international importance, and they are also instrumental in bringing to light many facts bearing upon the question of social economy. He goes on to say that up to the date of this meeting at Berlin the Congresses which had hitherto been regarded in the light of International Statistical Central Commissions, now partook more of the nature of *Enquête Commissions*, and gained considerably by the change, as their importance became greatly enhanced. Dr. Engel by his valuable work has no doubt done much to promote the study of statistics, a familiarity with their use, and the proper application of their results; and I am the more disposed to attach importance to his views on this subject as they form a forcible argument in favour of the establishment of such an institution as

that of which I am so strong an advocate. This institution is the more to be desired as it would consist of duly qualified members, and would exclude those recruited hap-hazard from various cities and towns who possessed no special qualification for the work in hand. It is greatly to be regretted that the detailed scheme proposed by Dr. Engel was postponed for future consideration and action, and relegated to an extraordinary special committee to be reported on, as it shared the fate of many similar proposals. *Le rénvoi des travaux à une session ultérieure, c'est le réjet adouci, mitigé.*

The defects of organisation which had been apparent in previous Congresses became more conspicuous in the transactions of the *Florence* Congress of 1867. Too much time was taken up by long speeches, against the prevalence of which Quetelet, the founder and zealous champion of Statistical Congresses, protested. The reports of the delegates instead of being fully discussed were generally printed in the *Compte-Rendu*, and consequently the conclusions lost much in earnestness and depth. At the Congress at Berlin the system of accepting the resolutions *en bloc* came into general use, and in Florence this questionable habit became more intensified, and many resolutions were accepted without full discussion. We may judge from this what is likely to detract from the good results achieved by Statistical Congresses, and what must be guarded against in the constitution of a new institution.

At this Congress, without breaking any new ground, the resolutions of all the previous congresses were confirmed, recommending the universal adoption of the metrical system, and several valuable suggestions were made on the formation of Statistical Bureaux, and on the perfection of official statistics in each country. The proceedings also resulted in a long series of resolutions affecting the statistics of fine arts, archives, libraries, and museums, and also as to the methods of obtaining a general form of survey of land. Some important questions were also introduced as to census enumerations. (See "Procès verbaux et "Resolutions de la Sixième Session du Congrès international de "Statistique," publié par le Docteur Maestri: Florence, 1867.)

Every meeting of the International Statistical Congress appears to have a new and increasing interest, and it cannot be denied that since the first of these meetings considerable improvement has been effected in the methods of statistical research, and it was gratifying to see the renewed interest that was manifested in the two next meetings, held respectively at the Hague and St. Petersburg, and the desire that was expressed to give practical effect to the proposed recommendations.

The *seventh* Congress was held at the *Hague* on September,

1869, and the labours of the Commission were greatly facilitated by a very elaborate and able paper by M. von Baumhauer, entitled, "*Ideés mères ou Plan motivé d'un programme pour la VIIième* "*Session du Congrès International de Statistique.*" Reviewing the work which had been done at the former meetings, and the questions still left incomplete, and wisely proposing to confine the points to be debated within definite limits of great interest to governments, he proposed their sub-division into five distinct sections. Each of these contained specific copies of debate, and under every head M. von Baumhauer has furnished the reasons for their selection, and a historical survey exhibiting the most varied research. Without adopting all the details, the Commission made this admirable paper the basis of their programme, and applied to the foreign official delegates and other scientific men, for their ideas upon them in order to give it as international a character as possible.

At the *Avant Congrès* many interesting subjects were considered, and amongst others a resolution was proposed that synoptical tables of the leading statistical facts of all countries should be periodically published in the same form and under the same headings. This resolution after considerable discussion was adopted, leaving the question of the date of publication and of the details to be inserted to the consideration of an international commission to be appointed later. The other resolutions passed at the meeting are too numerous to mention, but they are all to be found in the *Compte Rendu des Travaux de la* "*Septième Session,*" *&c.* (publié par M. von Baumhauer, seconde partie: La Haye, 1870). Among the principal questions discussed, the following deserve some passing mention: The Theory of Statistics and application of Statistical Data; Limits and Methods of Statistics; the Graphic Method of Statistics; the Question of Stillborn Children in relation to the Movement of the Population, &c. It only remains to notice that in Section V, Statistics of European Trans-oceanic Possessions, a very valuable historical and general account of the Dutch East Indian possessions, their administration and its results, was given in the programme. On this point it may be observed that the discussion which ensued gave a considerable impetus to colonisation generally. But the most important conclusion arrived at was the preparation of a plan for the publication of the great work of comparative international statistics.

It is unnecessary for me to dilate upon facts with which all of you assembled here are thoroughly conversant, and I will therefore merely confine myself to observing that at the Congress held in London M. Quetelet had already moved to prepare a plan by which the most important data of the different countries were to

be grouped together and shown in great detail. He himself, ably seconded by M. Heuschling, prepared a most valuable collection of population statistics, which was published at the expense of the Belgian Government. It soon became apparent that the very heavy labour in connection with the compilation of such a work as this was too much for one single bureau, and it was decided to divide amongst the most important States of Europe the compilation and preparation of international statistics; each one to undertake the completion of one or more parts of the whole programme.

On this point Dr. Engel, in an eloquent speech, proposed that in order to carry out the real objects of the congresses, the official delegates should meet together and each agree to take some specific subject, comparing the results, prepared on a uniform plan, with those of other countries, and thus by a sub-division of labour the desired end would be sooner attained. This proposition was received with general assent. A meeting was held, the plan discussed, and each branch of statistics divided into twenty-four chapters, allotted to the statistical bureau of a different country. It is called *Statistique Internationale de l'Europe.* This work was taken in hand, and it will be generally conceded that we are indebted in great measure to it for many valuable publications.

After an interval of nearly three years, Statistical Congresses again resumed their old activity in the *eighth* meeting, which was held in *St. Petersburg* in 1872, and at which many important schemes for carrying out the real objects of these institutions were discussed.

It would be impossible in a few words to summarise the numerous resolutions passed at this Congress, in view of the voluminous reports which were issued on the subject, but I cannot refrain from observing that the zeal displayed by the various delegates in the interest of statistical science, and the desire to give practical expression to the resolutions passed at previous Congresses, were conspicuously displayed at the meeting at St. Petersburg. His Imperial Highness The Grand Duke Constantine Nicolaiëvitsch, President of the Council of the Empire, was nominated as the honorary President by the Emperor Alexander II, and he in an eloquent speech paid a high tribute of praise to the zeal and devotion of the delegates. He remarked that at the present day all Governments recognise the value and importance of statistics, and are alive to the necessity of considerably enlarging the sphere of its investigation. A debt of gratitude is owed to the organisers of Statistical Congresses, for attracting renewed attention to the question of the statistical science, while the labours of the Congress have been directed to the goal of unification of statistical research, and this

end has been attained in more than one essential particular. There can be no question that the labours of the Congresses have always been the special stimulant of the development of statistical operations and research in those countries which have had the honour of receiving them.

One of the principal subjects of discussion at this Congress was the international programme of census operations, which, in connection with the facts relating to the movements of the population, and the mode in which they should be registered, is one of vital importance. From the very first Congress these questions have been constantly before the meetings; and every country now fully recognises the extreme importance of improving and perfecting this branch of statistics. Attention was also paid to the question of emigration, and considerable time was devoted to the discussion of the graphic and geographic methods applied to statistics. The Congress manifested also an anxious desire to give an impulse to the international and comparative statistics of industry and commerce, and means of communication.

The cause of statistical science was undoubtedly greatly advanced by the labours of this Congress, and more particularly by the establishment of a Permanent Commission of the International Statistical Congress, which was in great measure intended to replace the *Avant Congrès.* It was to consist of members to whom was to be assigned the duty of preparing international statistics, and to whom was to be entrusted the carrying out of the programme. Other countries not represented amongst them were to have the right to name delegates to the permanent commission. This sphere of action had been so mapped out that good results are experienced from it even at the present day. According to the decisions the following were to be its functions:—

(*a*). To acquire information as to the carrying out of the decisions of the Congress in the different countries, and on the difficulties in the way, and to examine if these difficulties require the decisions to be revised.

(*b*). To follow out the assimilation of the statistical publications in different countries, so far as is necessary for international purposes.

(*c*). To call the attention of the organisation commission to the questions to be debated at the next Congress, and to assist in preparing the programmes for the session.

(*d*). To obtain international researches so as to present to the organisation commission of the following session, reports on the state in each country of the questions to be proposed. Every report to the general assembly of the

Congress on any question should be preceded by an international inquiry.

(*e*). To complete any international work of the character of that agreed upon at the Hague, to decide upon any questions which arise in the course of their execution, and to arrange the programmes.

(*f*). To revise the publication of the decisions of the Congress.

The commission thus constituted held its sittings at Vienna in 1873, and at Stockholm in 1874, and later at Buda-Pest, 1876, when the work was revised and the next questions for the deliberations of the International Congress prepared, and endeavours were also made to carry through a grand scheme of international statistics, certain subjects being assigned to each country. We are especially indebted to the holding of the Stockholm commission for a collection of valuable works by eminent statisticians, in which the various branches of statistics are ably dealt with, and in which the value of international commissions was so clearly demonstrated. ("Commission Permanente du Congrès International de Statis-"tique.—Mémoires:" St. Pétersbourg, 1876.)

We now come to the *ninth* and last International Statistical Congress, which was held at *Buda-Pesth* from 29th August to 11th September, 1876. The programme was one of extraordinary length and interest, as the questions to be submitted for discussion extended over a great variety of subjects. (See "Programme de "la Neuvième Session du Congrès Internationale de Statistique:" Buda-Pest, 1876.) Some idea may be formed of the importance and variety of the questions submitted at this Congress when we state that the proceedings covered 1,757 pages quarto, exclusive of the catalogue of the exhibition of statistical graphics, which was equally voluminous. The Buda-Pest Congress undoubtedly assumed more of an international character than any of its predecessors, excepting perhaps the first Congress held at Brussels. This is evidenced by the extraordinary interest evinced in the proceedings by representatives of all nations. The attendance of so many learned and scientific men of all nationalities, conclusively proved that the interest taken by statisticians in the proceedings of these Congresses had by no means diminished.

The learned Dr. Adolphe Ficker, reviewing the results of this session ("Statistische Monatschrift:" Wien, 1876, pp. 395—448), states that this Congress, although the last, appeared to exercise a greater attraction than had been anticipated, as scientific men in great numbers repaired to it from all quarters of the globe, to consider and lend their assistance in the solution of the many interesting problems submitted to it. Among those present were

267 Hungarians, 30 Russians, 33 Germans, 12 Frenchmen, 16 Belgians; and England, Greece, Servia, Roumania, Egypt, Japan, and Brazil were also represented. The proportion of foreigners present at the Buda-Pest Congress was 40 per cent. as compared with 43 per cent. at Brussels, 35 per cent. at Paris, 24 per cent. at the Hague, 20 per cent. at Vienna and St. Petersburg, 18 per cent. at London, 17 per cent. at Berlin, and 11 per cent. at Florence. These figures in themselves constitute a proof that the interest taken in the question of international statistics was certainly not on the wane at this last Congress, but, on the contrary, was greatly on the increase; and I think we may venture to hope that, in time to come, and we trust at no very distant date, the same measure of success that attended the Buda-Pest Congress may also attend the future meetings of an International Statistical Association.

Again I would venture to call your attention to the fact that at this Congress the labour to be undertaken was distributed amongst the various sections, and the *plenum* adopted the numerous resolutions passed without debate, an example well worthy of imitation at future meetings. The resolutions arrived at extended to the improvement and amplification of every branch of statistics; although, as may be gathered from the past history of International Statistical Congresses, the resolutions themselves caused no startling innovations.

The enumeration of the various resolutions passed by this Congress would take up too much of your valuable time, and I will therefore merely touch upon what I consider one or two of the most important subjects of discussion. For example, the question of the statistics of great cities, the movement of the population, the rates of mortality, and statistics of health, land tenure and mortgage, and the statistics of railways and the movement of internal commerce.

At the solemn close of the Buda-Pest Congress none of the members would have anticipated that the last opportunity had passed for an interchange of ideas and suggestions as to the best method of diffusing a knowledge of statistical science, of promoting the unification and harmonisation of international statistics, and of introducing reforms and improvements into the official statistics of the various countries. The Permanent Statistical Commission, which held its fourth session at Paris in 1878, contributed unfortunately to the premature end of these international meetings. Many useful measures and reforms were discussed, but the principal object of the meeting was to enlarge the scope and perfect the organisation of the Commission itself. As to its actual business, the chief subject appears to have been the

question of its future organisation and work, on which a sub-committee laboured for several days, and on the recommendation of the president, Dr. Keleti, it was resolved that:—

(*a*). An international organ should be created to serve as a medium of communication between the members of the commission in the intervals of their meetings.

(*b*). The execution of international statistical works.

(*c*). The programme, time, and place of the next meeting of the commission, and the next session of the Congress.

(*d*). The mode of nomination of special delegates or experts by the Commission.

I may refer, for a detailed account of the sitting, to the "Bulletin "et Procès Verbaux des Séances et Rapports de la Commission "Permanente:" Paris, 1878, as well as to Dr. Mouat's excellent report in the *Journal of the Statistical Society* and to my review of the business of the Permanent Commission, published in the "Statistische Monatschrift," vol. iv, pp. 397—420.

The members of the Permanent Commission were composed of:—

(*a*). The heads or members of the different official statistical services of each country, delegated by their Governments.

(*b*). The delegates of the statistical administrations of those great cities to which any part of preparation of international statistics had been assigned.

(*c*). Delegates of scientific societies, or others united by the Permanent Commission to assist in their labour.

(*d*). Persons specially nominated by the Permanent Commission.

A desire was expressed that direct official communication should be established between the various Statistical Bureaux and the members of the Permanent Commission, to whom should be relegated the duty of answering inquiries and of affording information on statistical matters. It was also proposed to establish an international Year Book, containing a summary for a series of years of the chief statistical data for each country, to publish a Bulletin, and to establish a library. The archives of the Commission were to be kept at the place of preparation of the Bulletin in Paris. It was also unanimously resolved that the members of the Commission should bring under the notice of their respective Governments the resolutions passed at the meeting, and to make the president acquainted with their decision before the end of 1878; and it was decided to abide by the decision of the majority of the Governments as to the manner in which

effect should be given to the decisions and results arrived at by the Commission. It was also agreed that the conditions under which the delegates were to recommend the acceptance of the decisions of the Commission to their respective Governments should be left to the judgment of these delegates.

The majority of the representatives of Statistical Bureaux had already recommended to their respective Governments the approval of these propositions, but some, and particularly the representatives of the Statistical Bureau of the German Empire, reserved to themselves absolute freedom of action as to the acceptance or otherwise of the decisions arrived at, at the Paris Commission. When the invitation to the sitting of the Permanent Commission at Rome, fixed for 1879, was made public, it was found that well known German statisticians were opposed to the acceptance of the invitation to the session of the Permanent Commission, as well as to the projected tenth Congress in 1880. This opposition was not without its effect, as the session, which should have been held in Rome in October, 1879, was indefinitely postponed; the president sent in his resignation, and it was thereupon resolved that it would be advisable to adjourn the future meetings of the Commission to a more fitting time for the consideration of international labours. From that time up till the present this favourable opportunity does not seem to have occurred, and it is for this reason that the eyes of the statisticians of all countries are turned, full of hope, towards the Jubilee of the Statistical Society of London, in the expectation that from it will spring a new and lasting Institution which shall adequately replace the former one.

Résumé of the Results of the International Statistical Congresses.

I will now briefly revert to the results that have accrued to science and the practice of statistics from the earlier Congresses and the Permanent Commission. From their very nature statistics can only make but very slow progress; they are in themselves in a great measure too dependent upon governmental legislation and administration, to be able, like other kindred sciences, of themselves to initiate reforms. They are too dependent upon the thousands of co-operators to strike out for themselves at once new lines. The results of the progress brought about by the organisation of International Statistical Congresses have been clearly evidenced during the thirty-five years that have elapsed since their initiation. Let us glance at a few of the most important of these.

(1). The relations that have been established between official and scientific statistics, from which may be traced the germ of development that has occurred in recent times in the history of statistics generally.

(2). The improvement effected in the statistical services in the majority of countries subject to the influence of western culture; for we find as a result of the impetus given by Statistical Congresses, that Central Commissions, or kindred institutions, have been established in many lands and in the great cities of Europe. For example, we now find Statistical Bureaux in Greece, Servia, Roumania, and Finland; while in extra-European countries, Uruguay, Montevideo, the Argentine Republic, Chili, Peru, and Egypt, have each their Statistical Department. In all these may be traced the indirect influence exercised by Statistical Congresses, and in very many cases a direct influence is clearly observable, and it is moreover a significant fact that since their suspension Statistical Bureaux have in several countries (for example in Egypt) disappeared, and centralisation has been abandoned.

(3). The exchange of publications between the various Bureaux and the diffusion of statistical knowledge generally.

(4). The great improvement effected in official statistics, and the introduction of a comparable system of international statistics which form the basis of useful year books.

(5). The great progress made during the last thirty years in the system of collecting the census returns, the returns showing the movement of the population, and the introduction and improvement of sanitary statistics.

(6). The perfection to which agriculture, trade, and industrial statistics have attained. This may be clearly traced to the improved forms suggested at the various Congresses. Statistics of shipping and railways, the regulation of official values, statistics of banks and credit institutions; all of these owe either their origin or their perfection to the suggestions and discussions of the different Congresses.

(7). The extended observations of the physical and geographical condition of men and States.

(8). That valuable but incomplete work, the "Statistique "Internationale." This in itself proves, especially as regards the question of statistics showing the movement of the population, merchant shipping, savings banks, &c., how much may be done by co-operation.

(9). The introduction of the graphic method applied to statistics, and the rapidly increasing use of tabular representations.

(10). The unification of weights and measures on the basis of the metrical system, a reform which has been advocated uninterruptedly by the Congresses from their commencement.

Finally, one of the chief results of the establishment of these Congresses has been to produce a mass of valuable publications, containing a wealth of scientific and statistical information. They

have also left behind them traces of their work which have become so deeply rooted that they defy the efforts of their most bitter opponents to obliterate them; traces that are so clearly observable, even up to the present time, that we can easily follow them to the goal of the advancement of the science and practice of statistics.

The experience that we have gained from the International Statistical Congresses, and the Permanent Commission confirms me in the opinion as to the importance of reviving these institutions. The defects of organisation, which, as time went on, became more apparent, and the evident reluctance of many influential statisticians to take part in the proceedings, may perhaps account for the fact that an interval of ten years has elapsed since the date of the last International Statistical Congress.

We rejoice that we can describe the present assembly as a statistical conference of an essentially legitimate international character, and we look upon this re-union as a desire to establish an Institution, whose aims should be the promotion of the growth of statistical science, and the advancement of statistical research and inquiry, on a firm and lasting basis, and we should be the more disposed to take advantage of the present opportunity that has been afforded us by the Statistical Society of London, to fully discuss and decide upon some definite plan of action, seeing that we cannot reasonably hope for a better opportunity than the present, of discussing the matter before such a representative assembly.

Proposed Plan for an International Statistical Association.

In the creation of a new Institution, care should be taken to remedy the faults and defects which were so apparent in the organisation of the International Statistical Congresses and the International Permanent Commission. For example, the undue prominence of the lay element, which was originally welcomed, because it contributed to the diffusion of statistical knowledge, and to the enlargement of the scope of statistical research. It soon however became apparent that it was a dead weight, and was attracted by motives which had but little in common with statistical research. I may here mention that the number of members present at the Congresses rose, as you are aware, from 153 at Brussels, to 751 at Florence, and averaged nearly 500 at the other Congresses. Then again the continual change of the members, which was brought about by the constitution of the Congress and Permanent Commissions, a change which necessitated considerable reduplication of work, a vast amount of superfluous discussion and the treatment of a number of subjects in a manner totally at

variance with that contemplated when the subjects themselves were introduced. And finally, the defects in the organisation of these Congresses lie principally in the semi or wholly official relations between them and their leading members to the Governments, whereby their own independent action and the free discussion by them of the various subjects were considerably hampered. But the chief danger was the idea that the Governments should be bound by the decisions of the Congress or Permanent Commission; and this danger was the more to be feared, as the final decisions of these assemblies could never be foreseen, and might be the result of a bare or purely accidental majority, and nothing was more detrimental to the authority of the Congresses than that they should on the one hand claim to speak authoritatively, whilst on the other hand, notwithstanding their position, their conclusions might be of no practical value, and could therefore never be carried out.

It appears to me that the composition of an Institution such as that I am now advocating could be effected in three distinct ways. The first form of organisation would be one of a forcible and authoritative character. It would be of great advantage if the Governments of different countries could agree to create a lasting International Conference, similar, for instance, to the Comité Internationale des Poids et Mésures of 1870; or to send delegates regularly to a meeting similar to the Postal Union Congresses of 1874, 1878, and 1885, the International Telegraph Conferences of 1865, 1868, 1872, 1875, and 1879, in order to lend their assistance in the solution of general international statistical problems. It is evident that these delegates could only be the directors of Central Statistical Commissions or Bureaux, and should be invested with full powers by their respective Governments to enable them to pass binding resolutions.

There can be no doubt that such an organisation would contribute to the desired end in bringing about, for example, the uniformity and simultaneousness of census enumerations and the preparation of their results, and international comparative trade statistics, &c. Notwithstanding the exclusive nature of such an official convention, science would probably be satisfied, for it might soon reasonably expect the best materials for its work, and there would be nothing to prevent the most distinguished scientists from attending these conferences as experts; nor indeed is there anything to prevent a close union of statisticians of all countries.

It would be well for us always to have our thoughts concentrated upon the prospect of the ultimate realisation of such an organisation. It is far from probable however that the Governments of the European States would ever give up so large a part of their sovereignty and autonomy as to agree to be bound by any

hard and fast regulations affecting the official statistics of their country. It must be remembered that statistical progress is so nearly allied to legislation and administration, that in many cases a system of uniformity of statistical progress would be followed by uniformity of legislation.

However desirable for many reasons this may appear to us to be, it might have the effect of actually undermining to a certain extent the constitutions of individual States.

A second form of organisation would be an International Statistical Association invested with semi-official character, similar to the International Permanent Commission, which was chiefly composed of heads of Statistical Bureaux sent as delegates by their respective Governments, and of members of scientific societies. The opposition with which a similar proposal was met in 1878 and 1879, and the reception which was accorded to Dr. Engel's suggestion to establish a "Ständige Deputation" in 1863, are too well known to need recapitulation here. We can have therefore to-day no reasonable expectation of the ultimate realisation of the object we have in view, unless we are prepared to accept many modifications in the semi-official character of the composition of this Statistical Association.

The third form of organisation partakes more of the nature of a *free association*, divested of any official character, but which would endeavour to establish a basis for the uniformity of official statistics. At first sight, it might appear that this free Association would be wanting in weight and authority owing to the absence of official cohesion. There can be no question however that its decisions would carry considerable weight owing to the great personal influence of the members of which it would be composed, and to their valuable labours. And in this connection I am inclined to the opinion that with a view to infusing strength and vigour into the Association, it would be well that the members composing it should be recruited from among the heads of Statistical Commissions, Bureaux, or Societies, and from the distinguished representatives of scientific bodies, and others possessing special qualifications, drawn from the various European States. Only the actual members should be entitled to vote for or against the various resolutions proposed, on matters affecting the organisation of the Association itself, or on questions relating to suggested statistical reforms, as the practical experience and knowledge of the heads of Statistical Bureaux must necessarily on these points be invaluable. A limited number of corresponding members or associates should be allowed to participate in all the branches of work undertaken by this International Statistical Association. Honorary members may also take part in this branch of the work. In order to mark

the aims and aspirations of this Association, I would suggest that it be known by the designation of "Institut International de "Statistique," recalling in this connection the excellent work performed by that most justly celebrated scientific body the Institut de France, as well as that performed by the "Institut "de Droit Internationale," which during its comparatively short career has won for itself so high a place in the public estimation. I have been guided in the sketch I have drawn up for the management of a future Association by the Oxford revised statutes of this latter "Institute," and I think it will be generally conceded that the foregoing remarks on the past history of Statistical Congresses will afford us ample food for reflection as to what should be retained and what eliminated, in order to establish on a firm and lasting basis an International Union of celebrated statisticians. I anticipate in the discussion which will ensue on this subject, many valuable suggestions as to the designation of the Association whose establishment I am advocating, and as to the rules for its future guidance.

According to my idea the Society should consist of eighty members and eighty associates, with an unlimited number of honorary members, for such an Institution as is contemplated would be able to find room for all who were really qualified to take part in its proceedings. My proposition is, that the Council or Executive (Bureau) should be reconstituted every two years, as this in my opinion would have the effect of removing any cause for international jealousy, and would promote the furtherance of international labours. It is also greatly to be desired that the Association should number amongst its members those who have for some time past withdrawn from active participation in international statistical work, as owing to their vast practical experience and their long and distinguished services, they are pre-eminently qualified to render the most valuable aid to the cause of international statistics. The very flattering receptions accorded to my previous suggestions on this subject, and especially the encouragement I received from my distinguished friend Baron de Czœrnig, induce me to hope that our efforts in the cause of International Statistics will not be fruitless. And now in conclusion, let me call your attention to a few rules and regulations I have drawn up affecting the constitution and working of the proposed Association.

Provisional Rules and Regulations of the "International Statistical Institute."

(*Institut international de Statistique.*)

ARTICLE I.

The International Statistical Institute is an international association having for its object the development of the progress of administrative and scientific statistics:—

(1). By introducing uniformity in the compilation of statistics, and in promoting the compilation of statistical publications, with a view to a comparison of the results obtained in different countries.

(2). By calling the attention of the Governments to the various problems capable of solution by statistical observation, and by applying for information on those subjects which have not hitherto been subjected to statistical treatment.

(3). By establishing international publications, as a means of bringing into communication the statisticians of various countries.

(4). By endeavouring, through the medium of publications, public instruction and other means, to promote and foster the knowledge of statistical science, and to stimulate the interest that should be taken by States and individuals in the study of social phenomena.

ARTICLE II.

As a general rule a session to be held every second year. At each sitting the date of the next session and the place of meeting to be designated by the Institute. This question may be referred to the Council.

ARTICLE III.

The Institute to be composed of members, honorary members, and associates.

ARTICLE IV.

The members to be chosen from among the heads of official statistical bureaux, from among the members of central Statistical Commissions, Municipal Statistical Bureaux, and Statistical Societies, and from distinguished persons of different nationalities who may possess special technical qualifications in the region of administrative or scientific statistics. The total number of members is not to exceed eighty, but this limit need not necessarily be reached.

ARTICLE V.

The Associates to be chosen by the members from among those whose special knowledge or technical qualifications may be considered of service to the Institute. They may be present at the sittings, and vote on all occasions and on all subjects, with the exception of the following:—

(1). The rules and regulations.
(2). The elections or finances of the Institute.
(3). The suggested reforms in the official statistics of the different States.

The total number of associates not to exceed the number of members.

ARTICLE VI.

In the event of an election occurring to fill up existing vacancies, the number of representatives to be elected from any individual State or confederation of States not to exceed the fifth of the number of members existing at the time of the election. The same rule to be observed in the case of associates.

ARTICLE VII.

The title of honorary member may be conferred on members or associates, or on any persons who have distinguished themselves in official or scientific statistics. Honorary members to enjoy the privilege of receiving all the publications of the Institute, and to participate in all the advantages enjoyed by active members.

ARTICLE VIII.

At the commencement of each ordinary session, a president and two vice-presidents to be elected, and enter at once upon their duties.

ARTICLE IX.

A general secretary to be appointed by the Institute from among the members, and his appointment to last for two years. Authority to be given to him to appoint one or more secretaries or clerks to assist him in carrying out the duties of his office. The general secretary to be entrusted with the duty of drawing up the reports of the meetings, with the necessary correspondence, the editing of the publications, and the execution of the decisions of the Institute, unless the Institute decrees otherwise. He is to take charge of the archives, and his house to be considered as the office of the Institute.

Article X.

The president, the two vice-presidents, and the general secretary to form the Council, and in the intervals between the meetings to attend to any special questions demanding the immediate attention of the Institute.

Article XI.

A treasurer to be nominated for a period of two years by the Institute, to whom all financial questions are to be referred, and who is to be responsible for the accounts of the Institute. He is to prepare and present a financial report during the course of each session.

Two members to be appointed as auditors at the opening of each session, whose duties will be to examine the treasurer's accounts. A separate report to be made by them during the course of the session.

Article XII.

As a general rule at the meetings of the Institute votes on the subjects of the various resolutions submitted will be given verbally and after discussion. In all cases where it may be necessary to take a poll, the names of the members or associates who voted for or against, or who abstained from voting, to be mentioned in the report. Officers to be elected by ballot, and only those members actually present to be allowed to take part in it. But in the case of the election of new members or associates, absentees may send their votes written, and enclosed under cover.

Article XIII.

In exceptional cases, where it may be considered necessary by the Council, the votes of absentees may be obtained by correspondence.

Article XIV.

The Institute shall appoint from among its members and associates a chairman, and a committee, to consider the questions which are to be submitted to the deliberation of the Institute, and to assist in the preparation and compilation of special international statistical publications. During the intervals between the sessions, these duties to be undertaken by the committee, or in case of necessity the general secretary is himself to prepare the reports and conclusions of the Institute.

ARTICLE XV.

The Institute will issue :—

(1). A monthly bulletin.
(2). An International Statistical Annual.
(3). Special international statistical publications.
(4). Reports of the meetings.

The monthly bulletin will contain :—

(*a*). Reports on the organisation and the reforms in the official statistics of different countries, changes in the staff, &c.
(*b*). A *précis* of the more important results obtained by recent observations.
(*c*). An international manual of statistics, giving a review of recent publications and the contents of statistical journals and periodicals.

The Annual will contain any international comparative statistics that may be prepared on the basis of the information supplied by the various States.

ARTICLE XVI.

The expenses of the Institute to be met as follows :—

(1). By subscription from members and associates, to be fixed at the rate of 1*l.* sterling = 20 marks = 25 frs. = 10 florins. Subscriptions to be due from the date of election. They entitle to all the publications of the Institute. Any member being two years in arrear with his subscription will be considered as no longer belonging to the Institute.
(2). By subscriptions received from Central Commissions, Statistical Bureaux, and Societies of different countries, the States contributing to be supplied with a certain number of copies of all the publications of the Institute.
(3). By donations and other gifts, a fund to be established sufficient to defray the clerical expenses, and also to meet the expenses of publications, meetings, and general expenses of the Institute.

ARTICLE XVII.

The present rules to be revised, wholly or in part, during the second sitting of the Institute, and later, on the application of ten members. Such application to be made to the Council, giving reasons for making it, three months at least before the commencement of the session.

Provisional Regulations affecting the Election of Members.

ARTICLE I.

The first election to take place on the foundation of the Institute; those seeking election to state whether they desire to be elected as members or associates, and to give full particulars of nationality, &c.

ARTICLE II.

The maximum number of members and associates of each nationality to be fixed in the following proportion for the first election:—

Argentine Republic	1	Norway	2
Austria	5	Portugal	1
Belgium	3	Roumania	1
Bulgaria	1	Russia	5
Denmark	2	Servia	1
Finland	1	Switzerland	2
France	9	Spain	1
Germany	12	Sweden	2
Greece	1	Turkey	1
Hungary	4	United Kingdom	8
Italy	8	United States	8
Netherlands	2		

ARTICLE III.

Before the election each candidature will be considered, and the assembly will then proceed to the election of members and associates. The elections will be by ballot.

ARTICLE IV.

Those members will be elected who obtain more than half the number of votes polled, with the proviso that the number obtaining this majority does not exceed the number of places determined under Article 2 of the Regulations, and Articles 5 and 6 of the Rules.

In the event of the number exceeding that stipulated in these articles, those who obtain the greatest number of votes are to be considered as elected. The elimination proceeds by limiting the number of each nationality to the proportion indicated above, which must not be exceeded, and the number of members and associates is limited to the number of places to be filled. These operations to be performed by drawing lots.

Discussion *on* Professor von Neumann-Spallart's Paper.

Dr. K. T. von Inama-Sternegg: Gentlemen—I beg to propose an amendment to the resolution you are going to take about the foundation of a Statistical Institute, which is created as a free association of statisticians of the different countries, and which indeed can easily be supported only by the continual co-operation of them. It will in this way be able to give productive incitement to all spheres of statistics, and will deepen the problems already undertaken. But with *that* are defined the limits of its efficiency. It never will be possible for the Institute—

Either to proceed to the practical performance of enumerations and other collections of statistics, or

To effect the execution of its own resolutions and the fulfilment of its own wishes by its own unaided strength.

In respect to that it always will want the work of the official statistics, the great and uniform regulations of which only are at present able to give new material to the science, and to give to the material that degree of exactitude and completeness which the science demands. To complete the arrangements of international statistics, and, what is more, to get perfect these institutions, *the co-operation of the Governments and its representatives* seems to be indispensable. But it is not sufficient that the presidents of the statistical offices personally have a share in this institute. (They are only private in this case!) It would be a troubling of the relations if they would appear as *official* representatives *in the institute itself* (as it was in the permanent commission, not very advantageously indeed to the progress of the matter). Only by a conference of exclusively official statistics *beyond a free institute* does it seem possible that the scientific and the official statistics should unite to complete one another, instead of interfering and troubling each other in their separate endeavours. For that reason, gentlemen, I beg to propose to you the following order of the day:—

"That this meeting is of opinion that the proposed International Statistical Institute will, as a free and scientific association, greatly promote the attainment of International Statistics; but that, in order to further their object and to secure practical progress and results, it will be necessary that it should have the support of the various Governments. It is therefore desirable that the Governments should, by means of diplomatic action, make arrangements for periodical conferences of official delegates, who shall meet at certain intervals, at their respective bureaux, in rotation, for the purpose of working out and elaborating propositions for attaining uniformity, to be recommended to their respective Governments."

Dr. Mouat said he had read the propositions of Professor von Neumann-Spallart with great care, and while he admired much the skill with which his scheme had been drawn up, he was afraid they were scarcely in a position to accept it at once, either *en bloc* or in detail. The general proposition might be safely accepted, that of establishing an International Statistical Association, but he did not think they ought to adopt any strict limitations until they had ascertained how far they would be agreeable to and fit into the circumstances of the various nations whose co-operation was to be invited. As to the abstract proposition, he thought that a better scheme could scarcely be suggested, but he deprecated most strongly the idea of giving an official character to the institution as would be done if they asked foreign Governments to take any immediate part in its organisation. It was that official character which had led to the wreck of the original Statistical Congress, and any similar attempt would he believed lead to a similar result. It would be far better to have a free and independent International Statistical Society, and if it were thus unofficially established, the various Governments might delegate persons to take part in it without incurring any official responsibility, but if they endeavoured to give it an official character, the whole scheme would be ruined *ab initio.* He suggested that they should accept the proposal of Professor von Neumann-Spallart to establish an International Statistical Congress, but leave the details to be worked out by an organising committee in consultation with delegates of the various nations represented at this meeting. They would then be prepared at its first regular meeting hereafter to establish permanently the future organisation of the association. If time allowed he could say a great deal on various points of detail. He had endeavoured from time to time, with the permission of the Statistical Society, to re-assemble the Permanent Commission in London, and he had found that there was a general consensus among the great statisticians of Europe whom he addressed as to the formation of an International Statistical Congress strictly unofficial in its character. They were greatly indebted to Professor von Neumann-Spallart for having taken so much pains to draw up the regulations and formulate them so definitely, but he thought it would be imperilling the future success of the institution to attempt to determine finally the details at the present meeting. He begged to suggest, "That this meeting accepts in principle the proposal for an International Statistical Association as formulated by Professor von Neumann-Spallart, but is of opinion that such an association should be dissociated from the limitation of its members and associates to any fixed number of persons belonging to each nation, so as to remove the objections of Greece, Spain, and other countries; and that a special International Organising Committee to work out the provisional details be appointed by this meeting."

Mr. Frederick Hendriks said that he should be glad to be allowed to second the proposition of Dr. Mouat, which he considered to be not in opposition to that of Professor von Neumann-

Spallart, but as a great improvement upon it in a practical point of view, as it omitted the disturbing element of the co-operation of a certain number of different Governments as a condition precedent to the establishment of the suggested international institution. He could not but conclude that if they waited for such a co-operation, or for Governments taking the initiative, the whole proposal, excellent as it was, would be indefinitely postponed. In fact it would be completely shelved—remitted, as it were, until the Greek Kalends should come round. Let this meeting bear well in mind that at various times during the last thirty-four years efforts of a more or less persistent character had been made to establish it under direct auspices of various government officials, who had been of opinion that the statistical bureaux of different countries might join in giving effect to the scheme. If, as was the case, nothing had come of it in this past long period of time, there was good reason to doubt whether a better result could be attained in the next thirty-four years, unless the conditions of the problem to be solved were amended in the way indicated by the amendment brought forward by Dr. Mouat. One of the reasons why failure had attended the previous efforts that had been made upon the lines of proceeding so ably sketched in the proposals of their esteemed colleague Professor von Neumann-Spallart, had been that they involved a good deal of expense, and the funds to defray it had not been forthcoming. They had not been supported by pecuniary subsidies from the different Governments, who had shown themselves either unwilling, or at least disposed to delay, to give anything towards the establishment of such an institution in the past; so that, unless there now existed a more enlightened and more liberal way of regarding it, he doubted whether it could be established at all if it relied solely on the support to be obtained from government administrations or executives only. If they could found an institution of a more general, or rather of a less exclusive, character, including in its body a considerable number of persons, not necessarily officials, but interested in international statistics, and associated of course with the chief official and administrative statisticians of many different countries, it would have more authority in public estimation, and would perhaps have less difficulty in collecting the funds that were absolutely necessary to make its existence a thoroughly well-established success. Just as financial prosperity is the necessary "sinews of war," without which a nation can do but little to advance its views, so is it just the same in the case of any scientific institution which hopes to make a propaganda of those views that it considers beneficial to the world at large. Apart from the amendment of Dr. Mouat, which, on the grounds he had just stated, he ventured to think would be agreeable to this meeting, he confidently anticipated that all else in Professor von Neumann-Spallart's excellent and interesting communication, setting forth as it did the advantages to be expected from the establishment of an International Statistical Institute, would also be cordially adopted in principle by the unanimous vote of the distinguished statisticians present to-day. And in that hope he begged to second the amendment of Dr. Mouat.

Professor LEONE LEVI said they were all greatly indebted to Professor von Neumann-Spallart for his excellent paper. He greatly appreciated its value, and also the importance of the observations made by Dr. Mouat and Mr. Hendriks, and he thought that the best way to bring the matter to a practical issue would be to resolve "That this meeting is of opinion that the proposed International Statistical Institute will greatly further the progress of international statistics; and in order to secure practical results it invites the Statistical Society of London to ascertain from the different Governments how far they would lend their support to such an institute, and communicate their opinion thereon to the leading statisticians, summoning if they think proper another meeting to consider the question."

Dr. MOUAT said that the original proposition was brought forward by himself, and seconded by Mr. Hendriks, and all others would have to be submitted as amendments.

Professor LEONE LEVI said he did not regard his proposal in the light of an amendment, because he thought on the general subject they were all agreed.

Mr. PALGRAVE said he begged to call attention to one sentence in Professor von Neumann-Spallart's paper: "Le renvoi des travaux à une session ultérieure, c'est le réjet adouci, mitigé." It was for that reason that he desired to support the proposition of Dr. Mouat. He had been struck with article 2, p. 5, of the provisional statutes and regulations fixing the highest number of members from different States. He observed that Greece was limited to one member while, Italy had eight, and all the English colonies were omitted altogether. How could they accept a proposition of that kind? They could not absolutely fix the numbers of the representatives then, but he was most anxious that the plan suggested by Professor Spallart should succeed.

Don A. DE MARCOARTU said that Professor von Neumann-Spallart's scheme of an International Statistical Institute was a very important one, but it was a difficult matter to settle at once the various questions that would necessarily arise in regard to its composition. He agreed with Mr. Palgrave in his observations with regard to the division of representation among the different nationalities, against which he had himself always protested. He observed that in the scheme as proposed Spain with its 7 millions of inhabitants in Europe, and its 25 millions of inhabitants in the colonies, had the same representation as Greece, Bulgaria, the Argentine Republic (which was once a province of Spain), Turkey, and Servia.

The PRESIDENT said that that was a matter of detail which did not touch the main principle. He was afraid there would be hardly time to discuss all the questions of detail.

Don A. de Marcoartu said he desired to second the proposal of Dr. Leone Levi.

Herr Kaufmann said he thought there had been some misunderstanding as to the proposal made by Dr. von Inama-Sternegg. It was not opposed to the formation of an International Association as proposed by Professor von Neumann-Spallart, but simply suggested that the Governments should themselves by diplomatic action make arrangements for periodical conferences of official delegates. He begged to support Dr. von Inama-Sternegg's proposal.

General Liagre said that there was an International Scientific Society already existing bearing some analogy to that proposed to be established, and it might be desirable that its rules should be consulted. He referred to the Société Géodésique Internationale.

A. N. Kiaer said he was sure all the members highly appreciated Professor von Neumann-Spallart's paper, although they might have different opinions as to some of the details of his proposal. He thought that the best mode of dealing with the question would be to adopt the proposal of Dr. Mouat. If they adopted the plan suggested by Dr. Leone Levi of referring the matter to the Statistical Society of London, the proposed Institution would not be of so international a character as it would be if they acted on the lines laid down by Dr. Mouat.

Dr. Grimshaw said he opposed both the amendments, and he did so on two grounds. In the first place if they proposed to enter into communications with the various Governments at the commencement of their proceedings, they would be very likely to postpone the regular formation of the Society for a very long time; and in the next place he thought they were much more likely to enlist the support of the various Governments in the world if they did not ask their support in the first instance. When the Association was formed it would soon be able to draw up a series of propositions which would give to the various countries an opportunity of communicating with each other respecting them. That could be much better done from outside than it could possibly be done by any one or two individual Governments starting the questions for other Governments to consider. He made those remarks from the experience he had had in trying to deal with various departments of the British Government. The Government was very desirous of making the statistics of the United Kingdom as comparable as possible, but in his experience in taking the Irish census, in dealing with judicial statistics, and arranging with his friends in London with regard to agricultural statistics and other matters, they had the greatest difficulty in getting their arrangements to accord with one another. He thought therefore that the proposed Society should be left as free as possible. He had no doubt that when it was constituted one of the first things its Council would do would be to communicate

with the Governments of the various countries of the world, but it would be very dangerous to ask their support at the commencement. They could go on to a certain extent without Governments, and as soon as that was recognised he believed the Governments would be ready to co-operate with them. With regard to the proportional representation suggested by Professor von Neumann-Spallart, it appeared to him to be somewhat inequitable, but that was a detail on which he would not enlarge.

M. Argyropoulos said he desired to support Dr. Mouat's motion. If communications had to be made with foreign Governments seeking their support, the correspondence might extend over months or years, and thus valuable time would be lost. His own Government, for example, might instruct him to put himself in communication with other Governments or bodies, and when the question of finance arose, Greece, which was a poor country, would want to know what other countries of a similar character were doing, and that alone might take many months to ascertain. If the constitution of the society were of an official character, it would be much more difficult to conduct than a free society established on an individual basis. As far as Greece was concerned, poor as it was, he was quite sure that the Government would be glad to assist the society even financially.

M. de Malarce said he believed that statisticians in almost all countries of Europe would be ready to adopt the proposal of Professor von Neumann-Spallart for the establishment of a free Association, and nowhere could such an Association be better formed than in England, where the people were in the habit of doing everything on the same principle. There was an International Law Association in existence, and it might be desirable to inquire on what principle it was based.

Dr. Körösi said that all statisticians were indebted to the London Statistical Society and to Professor von Neumann-Spallart for the opportunity at present afforded for the establishment of a free International Statistical Association. He believed that Dr. von Inama-Sternegg was of the same opinion, that he had no objection to the formation of such an Association, and that his own proposition was a strictly independent one. He had no doubt that when Professor Neumann-Spallart's proposal was submitted to the meeting, Dr. von Inama-Sternegg would vote for it. There was no contradiction between the two proposals.

The President asked Dr. von Inama-Sternegg if Dr. Körösi had accurately expressed his views.

Dr. von Inama-Sternegg replied in the affirmative.

M. Hunfalvy said if a free and unofficial Association were formed, it would necessarily put itself into communication with the various Governments, as he believed was done in the case of

the Société Géodésique, the Société des Poids et Mésures, and other societies of that character. He thought the meeting should accept the general principle laid down by Professor von Neumann-Spallart, and leave the details for subsequent consideration by a committee appointed for the purpose.

M. Troinitsky said he supported the proposal for the establishment of a free and unofficial International Association, which he thought might be started at once by the appointment of a provisional committee. At the same time he should be in favour of sounding the respective Governments with a view of ascertaining how far they were respectively willing to support the Association.

M. Levasseur said he believed there was a general desire to accept the principle laid down by Professor von Neumann-Spallart. He was very glad to find that that feeling existed, because he entertained it himself; and he believed that if they did not take advantage of the opportunity at present afforded, they might wait a long time for another opportunity equally favourable. There was now a concurrence of good will and a unique opportunity; let them take advantage of the opportunity in order to give effect to their good will. With reference to the proposal of Dr. von Inama-Sternegg, he begged to remind the meeting that those who were delegated to the present meeting by their respective Governments had no authority to bind those Governments in regard to any official action. As private individuals they could exercise their influence with the Governments in inducing them to recognise and co-operate with any society that might be formed of a private and non-official character. For himself he accepted the principle of such an Association, without committing himself to any of the specific regulations that had been proposed, the consideration of which he thought should be delegated to a special committee.

The President said if the meeting could come to a decision upon Dr. Mouat's resolution, an organising committee might be formed for the purpose of discussing the proposed articles which could be brought up at the afternoon sitting.

Dr. Leone Levi said as it was evident that they were all in perfect accord, he would withdraw his proposal.

Signor Bodio said that the statistical congresses were dead and buried, and the Permanent Commission had also ceased to exist for well-known reasons. The latter was composed almost exclusively of chiefs of statistical bureaux; while free-writers, professors, &c., were scarcely represented. It was now necessary to adopt the proposal of Professor von Neumann-Spallart, and to constitute a private association such as would elicit the sympathy and the indirect help of the Governments, but will not depend on their approbation. The meeting should not separate without having called such an institute into existence, by electing the moiety of

the total members. The greatest obstacle was in ascribing *à priori* the quota of members to the respective States, lest national susceptibilities should thus be brought into collision. It would be better to give up any such attribution, and to declare that the eighty or one hundred persons in Europe or America deemed most eminent in statistical research would be elected.

Professor von Neumann-Spallart said he thought there had been some misapprehension as to the nature of his proposal. He had suggested the formation of a free Association, not at all depending upon Governments, but seeking to secure the interest of Governments or of persons in their service, especially among the members of the Permanent Commission. The present opportunity was a most favourable one for the establishment of such a society. He might call it a monumental moment; and if they did not take advantage of it it might escape never to return. He agreed that there was no contradiction between his proposal and that of Dr. von Inama-Sternegg, the two proposals were consistent with each other, and the two methods might be carried out side by side. The free institution when established might appeal to the Governments to give its conferences more or less a diplomatic character. There was no opposition whatever in the two proposals. He knew nothing of the rules of the Société Géodésique, but he had examined the rules of the "Institut des Droits Internationaux," which had, indeed, served him as a model for the proposed Association. There was, he thought, more resemblance between the latter society and that proposed to be established than there was in the case of the Société Géodésique. The rules had been revised on several occasions, and the experience thus acquired had been of service to him in drawing up the rules of the proposed Association. With regard to the financial difficulty, he did not think it would be considerable. The chief expense would be that attending the publication of a monthly bulletin and an annual report. He thought a sum of 5,000 or 6,000 frs. would be sufficient for the commencement. Subscriptions of 25 frs. would be received from, say, 120 or 160 members, and he had no doubt that the different Governments would subscribe for several copies of the Society's publications, and in that way sufficient funds would be forthcoming. With regard to the place of meeting, he had no doubt that a good reception would be given to the Society if it chose Vienna for its first meeting; and it was no secret that M. Bodio was prepared to invite the members to visit some city in Italy next year or the following. He hoped that provisional regulations would be at once agreed to, it being a part of his proposal that "the present statutes shall be revised in whole or in part at the second session of the Institute," so that if any mistakes were made they could be easily rectified.

The President asked Dr. von Inama-Sternegg if he desired to press his resolution.

Dr. von Inama-Sternegg said he should be glad to have the

opinion of the meeting upon it, as there was no contradiction between it and that of Professor Spallart. His proposal was simply that the Governments should be invited to hold conferences amongst themselves.*

Dr. Mouat's resolution was then put and unanimously agreed to.

The President said he desired heartily to congratulate the members upon the result of their deliberations, and he begged to propose that a committee be formed to take into consideration the provisional rules proposed by Professor Spallart, and to bring up a report at the afternoon meeting; the Committee to consist of Professor von Inama-Sternegg, M. Bodio, M. Levasseur, General Walker, M. Troinitsky, M. Kiaer, M. Argyropoulos, M. Keleti, Dr. Mouat, and Mr. John B. Martin.

The motion was agreed to, and the meeting was adjourned at 1.30 p.m. until 5 p.m. The Committee to meet in the meantime at 3 p.m.

Wednesday, 24th June. *Third Day.*

AFTERNOON SITTING.

Sir Rawson W. Rawson, K.C.M.G., C.B., President, took the Chair at 5 p.m.†

The President called upon Dr. Mouat to bring up the Report of the Special International Committee appointed to consider the rules of the future Association.

Dr. Mouat said that the Special Committee had done him the honour to request him to occupy the Chair, in order that Professor von Neumann-Spallart, the author of the proposal, might have greater freedom of action in submitting his propositions and meeting any objections made to them. The Committee had gone carefully through the rules section by section, eliminating everything they thought opposed to the general feeling expressed at the morning meeting. They had, for instance, dropped entirely the section respecting the partition of numbers among the different States mentioned, because they felt that they were not in a position to determine that question at the present time. Other minor changes had also been made, and everything had been omitted which would tend to give an official character to the new Association or prejudice its interests in the estimation of the various countries that would be likely to be represented in it. It would,

* Eventually, by an unintentional omission on the part of the President, the resolution was not put to the meeting, but the opinion of the majority may be gathered from their recorded remarks.

† For proceedings of the General meeting of the Society, see *Journal*, vol. xlvii, part 3.

in the opinion of the Special Committee, be desirable to establish the Society at once by electing the first set of members at this meeting. When so started, it may fairly take its chance of surviving by the energy and activity of the representative members of the various countries concerned. He was convinced of the necessity of some international means of communication among statisticians of various countries in order to carry out the great objects they all had in view. When those means were provided by the new Association, he hoped they would no longer have to regret the premature decease of the old Statistical Congress, which had done so much good, at the time of its greatest usefulness, by the "unhappy despatch," for which there was no valid reason. The new Association would only ask for a fair field and no favour; it would be free and unofficial, and would do its best to promote the serious study of statistics in their international relations. The proposed regulations were not intended to be permanent. It would be for the members themselves, after full consideration, to determine at a future meeting what should be the permanent character of the institution. He had himself taken for many years great interest in the matter. He wrote respecting it when he had occasion to report to the Statistical Society of London the results of the Congress held at Buda-Pest, and of the admirable work done by the late Permanent Commission in Paris in 1878. Since then nothing has been done. With the sanction of the Statistical Society, he had endeavoured to call together a meeting of the Permanent Commission in London, but the effort failed, on account of the abstention of certain persons whose presence was considered necessary. The present opportunity was a very favourable one, and the cordial spirit with which the proposal had been received by so many distinguished representatives of various countries, led him to hope and believe that they were now entering a new epoch, which promised to be successful, in the study of international statistics.

Professor von Neumann-Spallart then read the proposed rules as amended by the Special Committee.

Rules and Regulations of the "International Statistical Institute."

Article I.

The International Statistical Institute is an international association having for its object the development of the progress of administrative and scientific statistics:—

(1). By introducing, as far as possible, uniformity in the methods of compiling and abstracting statistical returns, and by adopting it in the compilation of statistical publications, with a view to a comparison of the results obtained in different countries.

(2). By inviting the attention of Governments to the various problems capable of solution by statistical observation, and by applying for information on those subjects which have not hitherto been adequately subjected to statistical treatment.

(3). By preparing international publications, as a means of bringing into communication the statisticians of various countries.

(4). By endeavouring, through the medium of publications, and if practicable, by public instruction and other suitable means, to foster the general appreciation of statistical science, and to stimulate the interest of Governments and individuals in the study of social phenomena.

Article II.

As a general rule a session to be held every second year. At each sitting the date of the next session and the place of meeting to be determined by the Institute. This question may be referred to the Council.

Article III.

The Institute to be composed of members, associates, and honorary members.

Article IV.

The Members to be chosen from among persons of different countries, who have distinguished themselves in the domain of administrative or scientific statistics, such as the heads of official statistical bureaux, members of central Statistical Commissions, Municipal Statistical Bureaux and Statistical Societies, and others of reputation in this branch of science. The total number of members is not to exceed one hundred, but this limit need not necessarily be reached.

Article V.

The Associates to be chosen by the members from among those whose special knowledge or technical qualifications may be considered of service to the Institute. They may be present at the sittings, and vote on all occasions and on all subjects, with the exception of the following:—

(1). The rules and regulations.
(2). The elections or finances of the Institute.

The total number of associates not to exceed the number of members.

Article VI.

In the event of an election occurring to fill up a vacancy, the number of representatives to be elected from any individual State, or confederation of States, not to exceed the fifth of the number of members existing at the time of the election. The same rule to be observed in the case of associates.

ARTICLE VII.

The title of honorary member may be conferred on members or associates, or on any persons who have distinguished themselves in the domain of statistics. Honorary members to enjoy the privilege of receiving all the publications of the Institute, and to participate in all the advantages enjoyed by active members.

ARTICLE VIII.

At the end of each ordinary session, a president and two vice-presidents to be elected, who shall enter at once upon their duties, and with the general secretary shall constitute the Council for the ensuing session.

ARTICLE IX.

At the end of each session a general secretary to be appointed by the Institute from among its members, and his appointment to last for two years. Authority to be given to him to appoint one or more secretaries or clerks to assist him in carrying out the duties of his office. The general secretary to be entrusted with the duty of drawing up the reports of the meetings, and in concert with the president of carrying on the necessary correspondence, the editing of the publications, and the execution of the decisions of the Institute, unless the Institute should have decreed otherwise. He is to take charge of the archives, and his house to be considered as the office for the time being of the Institute.

ARTICLE X.

The president, the two vice-presidents, and the general secretary to form the Council, and in the intervals between the meetings to attend to any special questions demanding the immediate attention of the Institute.

ARTICLE XI.

A treasurer to be nominated for a period of two years by the Institute, who shall be charged with the management of the finances, and be responsible for the accounts of the Institute. He is to prepare and present a financial report in each session.

Two members to be appointed as auditors at the opening of each session, whose duties will be to examine the treasurer's accounts. A separate report to be made by them during the course of the session.

ARTICLE XII.

As a general rule at the meetings of the Institute votes on the subjects of the various resolutions submitted will be given verbally and after discussion. In all cases where it may be necessary to take a poll, the names of the members or associates who voted for or against, or who abstained from voting, to be mentioned in the report. Officers to be elected by ballot, and only those members actually present to be allowed to take part in it. But in the case of the election of new members or associates, absentees may send their votes in writing, and enclosed under cover.

Article XIII.

In exceptional cases, where the Council may be unanimous in considering it desirable, the votes of absentees may be obtained by correspondence.

Article XIV.

The Institute to appoint from among its members and associates chairmen, and committees, to consider the questions which are to be submitted to the deliberation of the Institute, and to assist in the preparation and compilation of special international statistical publications. During the intervals between the sessions, these duties to be undertaken by the Council, and in case of necessity the general secretary is himself to prepare the reports and conclusions of the Institute.

Article XV.

The Institute will publish:—

(1). A quarterly bulletin.
(2). An International Statistical Annual.
(3). Special international statistical publications.
(4). Reports of the meetings.

The quarterly bulletin will contain:—

(*a*). Reports on the organisation and reforms in the official statistics of different countries, changes in the staff, &c.
(*b*). A *précis* of the more important results obtained by recent observations.
(*c*). An international manual of statistics, giving a review of recent publications and the contents of statistical journals and periodicals.

The Annual will contain any international comparative statistics that may be prepared on the basis of the information supplied by the various States.

Article XVI.

The expenses of the Institute to be met as follows:—

(1). By subscription from members and associates, at the rate of 1*l.* sterling = 20 marks = 25 frs. Subscriptions to be due from the date of election. They entitle subscribers to all the publications of the Institute. Any member being two years in arrear with his subscription without sufficient cause, will be considered as no longer belonging to the Institute.
(2). By subscriptions received from Central Commissions, Statistical Bureaux, and Societies of different countries, who will thus become entitled to a certain number of copies of all the publications of the Institute.

(3). By donations and other gifts. Provision to be made for the gradual formation of a fund sufficient to defray the clerical expenses, and also to meet the charge of publications, meetings, and general expenses of the Institute.

Article XVII.

The present rules are provisional; they shall be revised and definitely settled during the next sitting of the Institute, after which they can only be changed on the application of twenty-five members. Such application to be made to the Council, giving reasons for making it, three months at least before the commencement of the session.

Discussion *on the* Rules *and* Regulations *of the* "International Statistical Institute."

Mr. Henry C. Burdett said he regretted that he had been obliged to leave the meeting on the previous day before Professor Marshall had completed the reading of his paper, which was one of great interest to him (Mr. Burdett), as a practical statist who had every day of his life to deal with statistics. He heartily welcomed the proposal of Professor von Neumann-Spallart; but recognizing, as he did, the vastness of the work to be accomplished, he did not think that Article XVI would enable the Association to do the work efficiently. Having only two hundred associates and members subscribing 1*l.* each, he did not see how they could hope to carry out the objects of the Association, and he feared that it might be in financial straits even in its early days, unless it received special donations to enable it to defray its initial expenses. He should be glad to co-operate in any efforts that might be taken in that direction, so that the Association might be placed on something like a sound financial basis. They would go to shipwreck unless they had sufficient funds to begin with. Whatever resolutions might be passed, they could not bear good fruit if they had only an income of 200*l.* a year. They ought to be certain that in establishing an International Association they were not going to meet with the fate of the International Statistical Congresses, but were about to establish a real living thing which would bring them all into communication, and produce satisfactory because adequate results.

The President said that the Committee had had the subject under its serious consideration, and it certainly would not be lost sight of. He agreed with Mr. Burdett that the matter was a very important one.

Mr. Palgrave said that Mr. Burdett had not suggested any means by which his proposal could be carried out. He (Mr.

Palgrave) would suggest that subscriptions should be required from the third class of members (honorary) as well as from the first and second classes, in order that adequate funds might be provided.

Mr. Burdett suggested that the amount of the subscription might be increased.

The President reminded the members that the proposed regulations were only provisional. The matter under discussion had been seriously considered by the Committee, consisting of gentlemen representing a number of countries and having had the experience of former Congresses, and they were of opinion that the amount proposed was sufficient to start with; but there was no objection to inserting the words "not less than" before the amount of the subscription.

Professor von Neumann-Spallart said he had no doubt that the publications of the Society would partially pay for themselves, and the expenses of the first year at any rate would, he believed, be entirely covered by the proposed subscription. He thought that the amount of the subscription should be definitely fixed.

Mr. Burdett said that if it was known from the first that the subscription was liable to be increased, no one could afterwards complain if he were called upon to pay an additional sum. He would propose the insertion of the words "not less than" as suggested by the President.

Mr. Burdett's proposal having been seconded, was put and negatived, and the provisional regulations proposed by the Committee were unanimously adopted.

Mr. Del Mar asked if provision had been made for inviting the membership and co-operation of the directors and chiefs of the statistical bureaux of the various States of the United States.

The President said he thought the question was answered by the second section of Article I. He now begged as President of the Statistical Society of London, and having had the honour of presiding on the present occasion, and having also had the pleasure of attending the recent meeting of the Statistical Society in Paris, to congratulate the members upon the issue of the present meetings. He agreed with all who had spoken on the subject in thinking that this was the most important movement for the progress of statistics that had been made for many years. It had been carried out in so practical a manner that he was confident it would bear practical fruits. He had now to submit the names of the original members of the institution proposed by the Committee. It did not pretend to be complete, but it was as complete as the Committee had been able to make it on the spur of the moment.

Schedule A.

Names, arranged in alphabetical order, of those who were present at the Jubilee Meeting of the Statistical Society of London on the 24th June, 1885, and who accepted their nomination as Members, or Honorary Members, of the "International Statistical Institute."

Number.	Names.	Titles.	Residence.
		1. Members.	
1	Bertillon, Dr. Jacques	Chief of Statistical Bureau of City of Paris: Director of the "Annales de Démographie:" Hon. Member of Stat. Soc.	Paris.
2	Bodio, Professore Luigi	Director General of Statistical Department, Rome: Hon. Member of Stat. Soc.	Rome.
3	Foville, Alfred de.....	Chief of Statistical Bureau, Ministry of Finance: Secretary of Superior Council of Statistics, &c.: Vice-President Stat. Society of Paris.	Paris.
4	Giffen, Robert, LL.D.....	Assistant Secretary of the Commercial Department, Board of Trade: late President of Statistical Society (of London).	London.
5	Hendriks, Frederick	Vice-President, Statistical Society (of London).	London.
6	Hunfalvy, Dr. Jean	Professor at the University.....	Budapest.
7	Inama-Sternegg, Dr. K. T. von	President of the Imperial and Royal Statistical Central Commission.	Vienna.
8	Kaufmann, Dr. Hilarion	Chief Recorder of the Central Statistical Commission: Deputy Comptroller-General of the Railways Section of the Imperial Control.	St. Petersburg.
9	Keleti, Karl	Chief of Royal Hungarian Statistical Bureau, Imperial and Royal Ministerial Counsellor, &c.	Budapest.
10	Kiaer, A. N.	Director of the Statistical Bureau of Norway: Hon. Member of Stat. Soc.	Christiania.
11	Körösi, J.	Director of Local Statistical Bureau: Member of Hungarian Academy of Sciences.	Budapest.
12	Levasseur, Emile	Member of the Institute of France: Professor at the College of France: Hon. Member of Stat. Soc.	Paris.
13	Loua, Toussaint	Secretary of Statistical Society of Paris: Chief of the General Statistical Bureau of France, &c.	,,
14	Martin, J. Biddulph	Hon. and Foreign Secretary, Statistical Society (of London).	London.
15	Mouat, F. J., M.D.	Late Vice-President and Foreign Secretary of Statistical Society (of London).	,,
16	Neumann-Spallart, Professor F. X. von	Professor of Statistics and Political Economy at the University and the Agricultural College of Vienna: Member of the Imperial Central Statistical Commission: Hon. Mem. Stat. Soc.	Vienna.
17	Palgrave, R. H. Inglis....	F.R.S., Fellow Statistical Society (of London).	Beltons, Great Yarmouth.
18	Rawson, Sir Rawson W.	K.C.M.G., President of Stat. Soc. (of London).	London.
19	Troinitsky, Nicolas	Director of the Central Statistical Commission, Ministry of the Interior.	St. Petersburg.
20	Walker, Francis A., LL.D.	Ph.D., LL.D., President of American Statistical Association: President of Massachusetts Institute of Technology: Hon. Member of Stat. Soc.	Boston, Mass., U.S.
		2. Honorary Members.	
1	Chadwick, Edwin.....	Formerly Commissioner of Poor Laws, General Board of Health, &c.	London.
2	Liagre, J., le Général	President of Central Commission of Statistics, Belgium: Perpetual Secretary of the Academy.	Brussels.

Schedule B.

Names, arranged in alphabetical order, of those who were not present at the Jubilee Meeting of the Statistical Society of London on the 24th June, 1885, and were, in their absence, nominated and invited to become Members, or Honorary Members, of the "International Statistical Institute:"—

Number.	Names.	Titles.	Residence.
		1. Members.	
1	Beaujon, Dr.	Professor at the University, &c., &c.	Amsterdam.
2	Becker, Dr. K.	Director of the Imperial Statistical Department.	Berlin.
3	Blenck, Emil C. J.	Director of the Royal Prussian Statistical Bureau.	,,
4	Block, Maurice	Member of the Institute of France.	Paris.
5	Böckh, Dr.	Director of the Statistical Department of State: Professor at the University.	Berlin.
6	Böhmert, Dr. Vict.	Professor: Director of the Royal Saxon Statistical State Bureau.	Dresden.
7	Brachelli, Dr. H.	Ministerial Counsellor: Chief of the Statistical Department of the Ministry of Commerce.	Vienna.
8	Bruyn-Kops, Dr. J. L. de	Member Second Chamber States General.	The Hague.
9	Burchard, Hon. Horatio C.	Director of the United States' Mint.	Washington.
10	Cheysson, E.	Chief Engineer of Roads and Bridges: Professor, &c.	Paris.
11	Conrad, Dr. Joh.	Rector of the University.	Halle a/s.
12	Correnti, Césare	Vice-President of the Superior Council of Statistics.	Rome.
13	Dodge, J. Rawson	Statistical Department of Agriculture.	Washington.
14	Ellena, Professore Vittorio	Director General of Excise.	Rome.
15	Ferraris, Dr. Carlo Francesco	Professor of Statistics at the University.	Padua.
16	Gad, Marius	Head of the Statistical Bureau of the Kingdom of Denmark.	Copenhagen.
17	Ibanez, le Général de	Director General of the Institute of Geography and Statistics.	Madrid.
18	Ignatius, Dr. K. E. F.	Director of the Central Statistical Bureau of Finland.	Helsingfors.
19	Jahnson, Jules	Counsellor of State: Professor at the Imperial University of St. Petersburg: Chief of Municipal Bureau of Statistics.	St. Petersburg.
20	Janssens, Dr. E.	Chief Inspector of the Department of Health of the City.	Brussels.
21	Knapp, Dr.	Professor at the University.	Strasbourg.
22	Knox, Hon. John J.	Formerly Comptroller of the U.S. Currency.	New York.
23	Kummer, J.	Director of the Federal Statistical Bureau.	Berne.
24	Leemans, Hubert	Director General of Statistics at the Ministry of the Interior.	Brussels.
25	Lexis, Dr. W.	Professor at the University.	Breslau.
26	Lorenz-Libernau, Dr. J. R. Ritter von	Imperial and Royal Counsellor of State in the Ministry of Agriculture.	Vienna.
27	Luzzatti, Luigi	Parliamentary Deputy: Professor at the University.	Padua.
28	Mansolas, Al.	Director of the Statistical Bureau, Ministry of the Interior.	Athens.
29	Messedaglia, Angelo	Senator: Professor of Statistics at the University.	Rome.

Schedule B—Contd.

Number.	Names.	Titles.	Residence.
30	Nimmo, Jos., jun.	Chief of Bureau of Statistics, Treasury Department.	Washington.
31	Ogle, Wm., M.D.	Superintendent of Statistics, General Register Office.	London.
32	Sidenbladh, Dr. Elis	Chief of the Central Statistical Bureau of Sweden.	Stockholm.
33	Strelbitzky, le Général	Russian Imperial Staff	St. Petersburg.
34	Soares, Dr. Sebastian Ferreira	Director General of Statistics, Finance Ministry.	Rio de Janeiro.
35	Tschouproff, Alexandre	Counsellor of State: Professor at the University.	Moscow.
36	Wright, Carroll D.	Chief of the United States' Bureau of Labour, and of the Massachusetts' Bureau of Statistics of Labour.	Boston, U.S.
37	Yvernès, Emile	Chief of Statistical Bureau, Ministry of Justice	Paris.
		2. Honorary Members.	
1	Atkinson, Edw.	Member of the American Statistical Association.	Boston, U.S.
2	Berg, Dr. Fr. Th.	Health Minister: formerly Director of the Central Statistical Bureau.	Stockholm.
3	Besobrasoff, Wladimir	Senator: Privy Counsellor: Member of the Imperial Academy of Science.	St. Petersburg.
4	Boccardo, Gerolamo	Senator	Genoa.
5	Czoernig, C. Baron de	Imperial and Royal Privy Counsellor: Ex-President of Imperial and Royal Central Statistical Commission.	Bruneck, Tyrol.
6	Engel, Dr. Ernst	Privy Counsellor: Director of Royal Prussian Statistical Bureau.	Dresden.
7	Ferrara, Francesco	Senator: Director of the Royal Superior School of Commerce.	Venice.
8	Goschen, The Rt. Hon. George J., M.P.	Formerly Minister of State: President of the Poor Law Board, &c.	London.
9	Guy, William Aug., M.D., F.R.S.	Formerly President of Statistical Society (of London).	,,
10	Kautz, Dr. Jul.	Professor at the University: Member of the Hungarian Academy of Science: Member of the Upper House.	Budapest.
11	Lampertico, Fedele	Senator	Vicenza.
12	Laveleye, E. de	Professor at the University	Liège.
13	Leroy-Beaulieu, Paul	Member of the Institute of France	Paris.
14	Magliani, Agostiro	Minister of Finance	Rome.
15	Mayr, Dr. G. von	Under Secretary of State	Strasbourg.
16	Oettinger, Dr. Alex. von	Professor at the University	Dorpat.
17	Roscher, Dr. W.	Privy Counsellor of Saxony: Professor at the University.	Leipzic.
18	Rümelin, Gustav., Dr.	Chancellor of the University	Tübingen.
19	Say, Léon	Senator: Member of the Institute of France	Paris.
20	Semenoff, Pierre	Senator: Privy Counsellor: President of Statistical Council.	St. Petersburg.
21	Vissering, Dr. Simon	Professor of Political Economy and Statistics at the University of Leyden.	The Hague.
22	Wilson, Jean	Privy Counsellor: Secretary of State at the Imperial Council.	St. Petersburg.

The List was unanimously agreed to; two or three additions and suggestions as to future additions were made.

The President said there were a few resolutions which the Council of the Statistical Society desired to propose, and in which he had no doubt the foreign visitors would gladly join.

Resolutions.

No. 1.

That the Statistical Society, assembled to celebrate its Jubilee, expresses its thanks to the Right Hon. Earl Granville, K.G., for his courteous reception of the delegates of foreign Governments to the Society's Jubilee Meeting, on Monday, the 22nd June.

No. 2.

That the Statistical Society desires further to express its thanks to the Right Hon. Earl Granville, K.G., and to Her Majesty's Foreign Office, for having made known to foreign Governments the intended Jubilee Meeting of the Society, and having thus materially contributed to its success.

No. 3.

That the Statistical Society desires to express its thanks to the several foreign Governments, Municipalities, and Societies who have delegated their representatives to assist on the present occasion.

No. 4.

That the Statistical Society desires to express its thanks to the Right Hon. the Lord Mayor for the hospitality extended by him to the foreign visitors to the Jubilee Meeting and to the Officers and Council of the Society on 22nd June.

No. 5.

That the thanks of the Statistical Society are due, and are hereby expressed, to the Senate of the University of London for the courtesy shown by them in placing their theatre at the disposal of the Society during their Jubilee Meeting.

No. 6.

That the thanks of the Statistical Society are due, and are hereby expressed, to—

(*a.*) The Council of the Royal Botanical Society;
(*b.*) The Council of the Zoological Society of London;
(*c.*) The Council of the International Inventions Exhibition, for the courtesy shown by them to the foreign delegates and visitors to the Jubilee Meeting,

and also to

(*d.*) The Committee of Council on Education, Science and Art Department, for allowing the Society the use of their Museum for the reception of its visitors on the evening of the 24th June.

The resolutions were unanimously agreed to.

The President said he desired at the close of their proceedings to thank all the foreigners present who had taken so much trouble to attend the meeting, and to give English statisticians the opportunity of making their acquaintance—might he say their friendship? He hoped that the present meetings would only be a commencement of the connection that had been established between the Statistical Society of London and other Societies of Europe and the United States. Such a connection had hitherto scarcely existed. No doubt there had been a great deal of friendly correspondence and an exchange of publications, but there had not been that active co-operation which he hoped would result from the present proceedings. He also hoped that the reception that had been accorded to their foreign friends had been sufficiently agreeable to tempt them to repeat their visit on some future occasion.

M. Bodio said he was authorised by his Government to invite the members of the new Association to hold their first meeting in Rome.

The President requested the first members of the new Institute to remain after the adjournment of the meeting, in order to arrange the future proceedings of the Association.

His Excellency Baron de Penedo, Minister of the Empire of Brazil, expressed, in the name of the foreign visitors, their gratitude for the reception that had been accorded to them. He also thanked the President for his admirable address and for his presidency at the meeting, and assured the members of the deep interest which he felt in the prosperity of the new Association.

The President thanked Baron de Penedo for the remarks he had made, and said it was his duty to adjourn the meeting for forty-nine years, when the centenary of the Statistical Society would take place. It was possible some—a few—of the members would have the opportunity of assisting at the next Jubilee Meeting, but as for himself and most of his colleagues they could have no such expectation. He hoped that they would be "mieux placés."

The proceedings then terminated.

FOREIGN PRESS NOTICES.

Extract from the French "Journal Officiel," 11th July, 1885—

"COMPTE RENDU DES TRAVAUX DU CONGRÈS DE STATISTIQUE DE LONDRES.

"La Société de Statistique de Londres célébrait cette semaine le cinquantième anniversaire de sa fondation. En réalité, c'est de 1834 que date cette grande institution; mais la mort de S.A.R. le Duc d'Albany avait fait reporter de 1884 à 1885 le 'Jubilee Meeting' qui vient d'avoir lieu: les noces d'or de la Société de Statistique de Londres ont ainsi suivi de bien près le noces d'argent de la Société de Statistique de Paris.

"Un grand nombre de savants étrangers avaient répondu à l'appel de la Société de Statistique de Londres. Parmi ceux qui représentaient, à titre de délégués, leurs Gouvernements respectifs, on peut citer: pour l'Autriche-Hongrie, MM. von Inama-Sternegg, Keleti, Hunfalvy, von Neumann-Spallart, Körösi; pour la Belgique, M. le Général Liagre; pour les Pays-Bas, M. le Baron von Verschuer; pour l'Italie, M. Bodio; pour la Norvège, M. Kiaer; pour la Russie, MM. Troinitsky et Kaufmann; pour la États-Unis, M. Walker. La France était représentée par MM. E. Levasseur, délégué des Ministres du Commerce et de l'Instruction Publique; T. Loua, délégué du Ministre de Commerce; A. de Foville, délégué du Ministre des Finances; M. Bourgeois, J. Bertillon, et Chervin, délégués de la ville de Paris; MM. Juglar, Robÿns, Liégeard, de Malarce, A. Bertillon, assistaient comme invités.

"Le Lundi 22, Sir Rawson W. Rawson, Président actuel de la Société de Statistique de Londres, a présenté successivement les invités de la Société au Comte Granville, alors Ministre des Affaires Étrangères, et au Lord Mayor, que leur a offert un banquet dans l'une des salles de Mansion House. Les séances du Congrès ont commencé le même jour. Après un remarquable discours du Président, des mémoires ont été lus par MM. Mouat, 'Histoire de la Société;' A. de Foville, 'La Statistique et ses Ennemis;' R. Giffen, 'De quelques Applications Générales de la Statistique;' Jeans, 'De l'Uniformité en Matière de Statisque;' Körösi, 'De l'Uniformité en Matière de Recensements;' Edgeworth, 'La Statistique Numérique;' E. Levasseur et Marshall, 'La Statistique Graphique.'

"Dans les deux dernières séances, M. von Neumann-Spallart a soumis au Congrès, qui l'a adopté, un projet d'Association Internationale entre les principaux statisticiens des peuples civilisés, en vue de faciliter la circulation de données aussi exactes et aussi comparables que possible sur les divers éléments de leur état social, économique, financier . . . Les statuts provisoires votés le 24 Juin sont analogues à ceux de l'Institut de Droit International. L'Association n'aura pas un caractère officiel, bien qu'elle semble appelée à rendre aux Gouvernements eux mêmes de précieux services. Elle

comprendra cent membres titulaires, cent membres associés et des membres honoraires.

"Un certain nombre de membres titulaires ont été élus séance tenante et l'Institut International de Statistique ainsi constitué a immédiatement nommé son bureau. Sir Rawson W. Rawson en est le Président, MM. Levasseur et Neumann-Spallart en sont les Vice-Présidents; les fonctions de Trésorier ont été confiées à M. John Martin et celles de Secrétaire-Général à M. L. Bodio, qui en cette qualité, est chargé de la rédaction d'un bulletin trimestriel et d'un annuaire de statistique internationale.

"On voit que la réunion provoquées par la Société de Statistique de Londres n'aura pas été stérile. Ajoutons que tous les étrangers qui y ont pris part conserveront un souvenir durable et reconnaissant de l'exquise courtoisie avec laquelle les honneurs de la ville de Londres leur ont été faits."

Extract from the "Bulletin Municipal Officiel de la Ville de Paris," 4th July, 1885:"—

"COMMISSION DE STATISTIQUE MUNICIPALE.

"*Séance du Mardi*, 30 *Juin*, 1885.

"*Rapport fait à la Commission par les trois délégués qui avaient été désignés pour représenter la Ville de Paris au Jubilee de la Société de Statistique de Londres.*

"Messieurs,

"Vous avez désigné à M. le Prévet de la Seine, dans votre dernière séance, pour représenter la Ville de Paris au Jubilé de la Société de Statistique de Londres:

"M. Léon Bourgeois, Secrétaire Général de la Préfecture de la Seine, Membre du Conseil Supérieur de Statistique, Président de notre Commission.

"M. le Docteur Jacques Bertillon, Chef des Travaux Statistiques de la Ville de Paris, Membre du Conseil Supérieur de Statistique, Membre Honoraire de la Société de Statistique de Londres.

"M. le Docteur Arthur Chervin, Membre du Conseil Supérieur de Statistique, Membre Honoraire de la Société de Statistique de Londres.

"Nous devons aujourd'hui vous rendre compte de notre mission:

"Si vous avez souhaité que le Ville de Paris fût représentée à cette solennité, c'est pour reconnaître les grands services que la Société de Statistique de Londres a rendus aux études que nous cultivons.

"Fondée en 1834, à la suite d'une session de l'Association Britannique pour l'Avancement des Sciences, cette Société célèbre compte aujourd'hui environ un millier de membres; elle publie depuis quarante-sept ans déjà, un *Journal* qui forme une collection

des plus précieuses pour l'étude des sciences sociales et économiques éclairées par le considération des chiffres.

"Les quelques renseignements qui précèdent suffiraient au besoin à montrer que l'anniversaire de la fondation de cette Société est un évenement scientifique considérable.

"Presque tous les pays de l'Europe avaient tenu à se faire représenter à cette solennité. Nous avons rencontré, à Londres: MM. Inama-Sternegg, von Neumann-Spallart, et Erben, de Prague, pour l'Autriche; MM. Keleti, Körösi, et Lang, pour la Hongrie; MM. Bourtourline, Kaufmann, et Troïnitzki, pour la Russie; M. Bodio pour l'Italie, M. le Général Liagre pour la Belgique, M. de Penedo pour le Brésil, M. Argyropoulos pour la Grèce, M. le Baron de Verchuer pour les Pays-Bas; M. Kiœr pour la Norwège; M. le Prince Jean Ghyka pour la Roumanie, M. le Général Walker pour les États-Unis. L'Allemagne n'était pas représentée.

"La France l'était par plus de personnes qu'aucune autre nation. Outre vos trois délégués, elle avait envoyé MM. Levasseur et Loua, tous deux membres de notre Commission, M. de Foville, délégué du Ministère des Finances, et enfin un grand nombre de statisticiens qui, sans attache officielle, avaient voulu témoigner par leur présence de leur sympathie pour la Société de Statistique de Londres.

"C'est un devoir pour nous que de vous dire la cordiale hospitalité que nous avons reçue pendant notre séjour à Londres. Lord Granville a bien voulu nous recevoir et témoigner de l'intérêt qu'il porte aux études statistiques. Le Lord Mayor de Londres nous a ensuite invités à déjeuner dans la Mansion House. Mais comment décrire ici la série des réceptions qui nous ont été offertes soit à Albert Palace par Sir Rawson W. Rawson, l'eminent President de la Société de Statistique, soit par cette Société elle-même? Nous avons pu voir, au diner du Jubilé, l'intérêt que les personnages les plus distingués portent à la statistique. Nous devons mentionner tout spécialement la fête magnifique qui a été donnée, à propos du Jubilé, dans les salles du South Kensington Museum.

"Si l'hospitalité collective dont je viens de retracer les principaux traits nous a vivement intérssées, nous avons été touchés de la cordialité que nous avons rencontrée chez chacun des membres de la Société; notre reconnaissance doit rester anomyne: elle n'en est pas moins profonde. Nous avons éprouvé une vive satisfaction à nous entretenir personnellement avec des hommes que nous ne connaissions encore que de nom, soit pour avoir lu leurs travaux dans le *Journal* de la Société, soit à tout autre titre: MM. T. Graham Balfour, Stephen Bourne, Hyde Clarke, James Heywood, Frederick Hendriks, W. Hancock, Karl Blind, Ravenstein, Cornelius Walford, et d'autres encore dont nous aurons à vous citer quelques-uns dans la suite de ce rapport.

"De nombreuses et intéressantes lectures ont été faites pendant les cinq séances qui ont eu lieu à l'occasion du Jubilé. Il ne nous est pas possible de les résumer ici, mais nous voulons les énumérer. Le Docteur Mouat, qui a été pendant de longues années le Secrétaire

de la Société et la rédacteur de son *Journal*, nous a retracé l'histoire des travaux de cette compagnie célèbre. Nous avons ensuite entendu : 'Statistical Developments, with Special Reference to Statistics as a Science,' par M. W. A. Guy ; 'La Statistique et ses Ennemis,' par M. de Foville, de Paris ; 'Some General Uses of Statistical Knowledge,' par M. R. Giffen ; 'On Uniformity of Statistics,' par M. J. S. Jeans ; 'On Uniformity of Enumeration and Analysis of Censuses,' par M. Körösi, de Budapest ; 'On the Numerical Method of Statistics,' par M. F. Y. Edgeworth ; 'On the Graphic Method of Statistics,' par M. Levasseur. Même sujet par M. le Professeur A. Marshall.

"Enfin, deux séances ont été consacrées à l'examen d'une importante proposition de M. von Neumann-Spallart. Le Professeur de Vienne, après avoir moutré l'utilité qu'avaient eu les Congrès de Statistique, et avoir étudié pour quelles causes ils avaient, depuis 1878, cessé de se réunir, a proposé la création d'un Institut International de Statistique.

"Cette proposition a été adoptée après mûr examen dans la séance du 24 Juin. Il a été convenu que cet institut, qui n'a point actuellement de caractère officiel, ne contiendrait, en dehors des membres honoraires, qu'un nombre limité de membres à savoir, au maximum, cent membres effectifs, et cent membres associes.

"Le but de cette institution est défini par l'article premier de ses statuts, dont voici le texte :

"'L'Institut International de Statistique est une association internationale qui a pour but de favoriser le progrès de la statistique administrative et scientifique :

"'1°. En introduisant la plus grande uniformité des méthodes, des cadres et du dépouillement des relevés de la statistique et en poursuivant l'assimilation des publications de statistique afin de rendre comparables les résultats obtenus dans les differents pays.

"'2°. En appelant l'attention des Gouvernements sur des questions à résoudre par l'observation de la statistique et en demandant des renseignements sur des matières qui ne sont pas encore ou pas suffisamment traitées par la statistique.

"'3°. En créant des publications internationales qui doivent établir des rapports continuels entre les statisticiens de tous les États.

"'4°. En concourant par ses publications, par l'enseignement public et par tous les autres moyens à la propagation des notions de statistique et de l'intérêt que les Gouvernements et la publicité doivent prendre à l'exploration des faits sociaux.'

"Voici encore quelques extraits des statuts qui font connaître la composition et les moyens d'action de l'Institut International de Statistique :

"'En règle générale, il y a une session tous les deux ans.' (Art. 2.)

"'L'Institut publie : 1° un Bulletin trimestriel ; 2° un Annuaire de statistique internationale ; 3° des travaux spéciaux de statistique internationale ; 4° le compte-rendu de ses sessions.

"'Le Bulletin contiendra (*a*) des rapports sur l'organisation et

les réformes de la statistique officielle des differents pays et sur les changements du personnel, etc.; (*b*) un précis des résultats les plus importants obtenus par des observations récentes; (*c*) une bibliographie internationale de statistique donnant un repertoire des publications récentes, le contenu des revues de statistique et des périodiques.

"'L'Annuaire contiendra les comparaisons internationales de statistique qui peuvent se faire d'après les renseignements fournis par les différents pays.' (Art. 15.)

"'Les frais de l'institut sont couverts;

"'Par les cotisations des membres et des associés fixées à = 1 livre sterling = 25 francs = 20 marcks = 10 florins;

"'2. Par les cotisations que les commissions centrales, les bureaux officiels, et les Sociétés de Statistique des divers États consentiront, et qui donneront droit à un certain nombre d'exemplaires de toutes les publications de l'institut.

"'3. Par des fondations et libéralité.' (Art. 16.)

"Ces citations suffiront pour montrer les importants services que l'Institut International est appelé à rendre et de quels moyens d'actions il compte se servir.

"Les bases que je viens d'indiquer ayant été adoptée, on a procédé à l'élection d'un certain nombre de membres honoraires et à celle de cinquante-et-un members effectifs seulement; parmi eux, on remarque plusieurs membres de notre Commission—MM. Levasseur, Cheysson, Toua, et Jacques Bertillon.

"Le première réunion de l'Institut International a eu lieu séance tenante; elle a été consacrée à l'élection du bureau. Le Président a été Sir Rawson W. Rawson. Comme l'a fort bien fait remarquer l'un de nous, M. Levasseur, cette nomination était à la fois un hommage rendu à l'économiste éminent, à l'administrateur distingué qui préside la Société de Statistique de Londres, et à cette société elle-même, dont le Jubilé a amené la création de l'Institut International.

"Les Vice-Présidents ont été: M. le Professeur Levasseur, notre collègue, et M. le Professeur von Neumann-Spallart, de Vienne, l'auteur du projet des statuts.

"Le Secrétaire Général a été M. Luigi Bodio, l'infatigable Directeur-Général de la Statistique du Royaume d'Italie, auteur de ces excellents 'Confronti Internazionali,' dont l'usage est familier à tous les statisticiens.

"Enfin, le Trésorier a été M. John B. Martin, Secrétaire pour l'Étranger de la Société de Statistique de Londres, l'un des principaux organisateurs de ces réunions, dont vous venez de voir les résultats.

"Tels ont été, Messieurs, les principaux actes du Congrès auquel vous nous avez envoyés. Vous jugerez comme nous qu'ils ont une grande importance. Nous n'avons pas seulement assisté à des fêtes brilliantes; nous avons été témoins de l'intérêt que les études statistiques excitent chez les hommes qui gouvernent l'Angleterre; nous avons entendu d'intéressantes lectures statistiques. Enfin il nous a été donné d'assister et de participer a la constitution de l'Institut International de Statistique, c'est à-dire

d'une association appelée sans doute à rendre de grands services à la Statistique internationale.

"C'est pourquoi nous croyons que le Jubilé de la Société de Statistique de Londres marquera une date importante dans l'histoire des sciences statistiques.

"Léon Bourgeois,
"Jacques Bertillon,
"Arthur Chervin.

"A la suite de cette communication, la Commission a décidé que l'expression de sa gratitude serait présentée au Président de la Société de Londres, ainsi qu'au Lord Mayor et au Gouvernement Anglais."

„Neue freie Presse," 10. *Juni* 1885.

..... Bei dieser Gelegenheit will ich für Freunde der Statistik bemerken, daß in vierzehn Tagen hier das Jubiläum des fünfzigjährigen Bestandes der Statistischen Gesellschaft gefeiert wird, deren vorjähriger Präsident eben Giffen war. Als F. R. S. S. kann ich mittheilen, daß die Discussionen sowol wie die socialen üblichen „Erholungen" in der Form von Diners, Luncheons beim Lord Mayor und Conversationen im South-Kensington Museum vielversprechend scheinen. Von Oesterreichern kündigen Vorträge an Herr J. Köröfi und Professor Neumann-Spallart; überdies zählt das officielle Programm noch eine Anzahl von Oesterreichern, die zum Jubiläum nach London kommen .....

„Neue freie Presse," 14. *Juni* 1885.

[Statistische Congresse.] Die beiden ältesten und angesehensten statistischen Gesellschaften, jene von Paris und von London, feiern in den nächsten Tagen die Jubiläen ihrer Gründung; die eine das fünfundzwanzigjährige, die andere das fünfzigjährige. Beide haben auf diplomatischem Wege die Vorstände der statistischen Bureaux und hervorragende Fachgelehrte aller Staaten Europas eingeladen, an diesen Festen theilzunehmen, und zwar nicht blos um der Aeußerlichkeiten willen, die bei solchen Anlässen entfaltet werden, sondern im Hinblicke auf den Gedanken, den Faden der internationalen statistischen Congresse, der bekanntlich im Jahre 1878 durch die Abstinenz-Politik des deutschen Reiches plötzlich abgeschnitten wurde, wieder anzuknüpfen. Besonders hat sich die Statistical Society von London das Verdienst erworben, schon in ihrem ursprünglichen, im December 1884 durch das Foreign Office an alle Missionen versendeten Circulär als den vorzüglichsten Zweck der Versammlungen zu bezeichnen, daß man „in Betracht ziehen werde, was durch die internationalen statistischen Congresse oder auf anderen Wegen bisher in Bezug auf die Gleichförmigkeit der Statistik erreicht wurde, durch welche Mittel dieses Ziel weiter befördert werden kann, und insbesondere, ob die Möglichkeit bestehe, eine internationale statistische Association zu schaffen." Der Einladung beider Gesellschaften,

welche ihre Verhandlungstage so festgesetzt haben, daß vom 15. bis 18. Juni die Pariser Société de Statistique und im Anschlusse daran vom 22. bis 25. Juni die Londoner Statistical Society ihre Sitzungen und Festlichkeiten abhalten, haben fast alle statistischen Bureaux, mit Ausnahme der sich noch immer reservirt verhaltenden deutschen, durch die Entsendung ihrer Vorstände entsprochen, und ebenso folgt derselben die Mehrzahl derjenigen Fachgelehrten, welche sich in früheren Jahren an den Congressen betheiligt hatten oder in der internationalen Statistik einen Namen tragen. Von Seite unserer Reichshälfte haben sich der Präsident der Statistischen Central-Commission, Hofrath v. Inama-Sternegg, und Hofrath Professor v. Neumann-Spallart als officielle Delegirte, von Seite Ungarns der Präsident des Statistischen Landesbureaus, Ministerialrath Keleti, und der Director des Pester städtischen statistischen Bureaus, Köröfi, bereits nach Paris begeben, um später natürlich auch an den viel wichtigeren Londoner Verhandlungen theilzunehmen. Bei diesen wird Ungarn durch einen Vortrag Köröfi's über „die Gleichförmigkeit des bei Volkszählungen und deren Analyse einzuschlagenden Verfahrens" activ betheiligt sein. Einem der Vertreter Oesterreichs aber, dem Hofrath Neumann-Spallart, wurde durch eine directe Einladung des Präsidenten Sir Rawson die Aufgabe zu Theil, das Referat über den wichtigsten Verhandlungsgegenstand: die Erfolge der früheren statistischen Congresse und Anträge zur Gründung einer internationalen statistischen Association, zu führen. Da diesem Referate ein längerer Bericht vorausgehen wird und sich daran eine ausführliche Discussion und eventuelle Beschlußfassung anreihen dürfte, hat die Statistical Society für dasselbe einen eigenen dritten Verhandlungstag hinzugefügt. Wir werden Gelegenheit haben, auf die Erfolge dieser Versammlungen, an deren Ergebnissen Oesterreich, wie es scheint, ein hervorragendes Interesse zu nehmen berufen ist, ausführlich zurückzukommen.

„Neue freie Presse," 23. *Juni* 1885.

[Statistischer Congreß in London.] Man telegraphirt uns aus London: Earl Granville empfing die Statistical Society. Er sagte in seiner Ansprache, obwol nicht mehr Mitglied des Cabinets, sei er doch überzeugt, daß jede Regierung, welcher Partei sie auch angehöre, glücklich wäre, die Vertreter der Statistik der ganzen Welt zu empfangen. Der Earl drückte sodann die Hoffnung auf die Fortdauer dieser internationalen Verbindungen aus. Nachher fand ein Frühstück beim Lord Mayor statt, wo auf die fremden Delegirten und die internationale Statistik, deren Gründung hier demnächst gehofft wird, toastirt wurde.

Extract from the „Neue Freie Presse."

London, 30. Juni. — Wie Ihre Leser ohne Zweifel schon aus den Tagesnachrichten wissen, haben die Jubiläums-Versammlungen der beiden statistischen Gesellschaften, welche am 15. Juni in Paris eröffnet und am 24. Juni in London geschlossen wurden, zu dem erfreulichen Ergebnisse der

Gründung einer dauernden Association, eines Institut international de Statistique geführt. Als die Société de Statistique in Paris ihre ersten Einladungen ergehen ließ und auf ihrem Programm nur eine Reihe von Vorträgen aus dem Gebiete der Geschichte und Theorie der Statistik angekündigt hatte, zeigte sich ursprünglich ein verhältnißmäßig geringes Interesse des Auslandes an diesen Festversammlungen. Erst als die Statistical Society von London, eine der ältesten und angesehensten wissenschaftlichen Gesellschaften Europas, in ihrer auf diplomatischem Wege an alle Staaten gelangten Einladung den vortrefflichen Gedanken ausdrückte, mit der Jubiläumsfeier die Errichtung einer internationalen statistischen Association zu verbinden, wurde die Aufmerksamkeit der Statistiker des Continentes und der Vereinigten Staaten von Amerika auf diese Versammlungen gelenkt. Die beiden Hauptpunkte der im December 1884 im Wege des Foreign Office versendeten Circular-Depesche besagten, daß die Tagesordnung der fünfzigsten Jahresversammlung der Londoner statistischen Gesellschaft bilden werde: „in Betracht zu ziehen, was durch die internationalen statistischen Congresse und durch andere Mittel in Bezug auf die Gleichförmigkeit der Statistik bisher erreicht wurde und auf welchem Wege diese Aufgabe weiter befördert werden könnte" — sowie „in Betracht zu ziehen, ob es nicht möglich sei, eine internationale statistische Association ins Leben zu rufen." Mit diesem Programme war sofort das kosmopolitische Interesse angeregt; denn man erinnerte sich mit welch weittragenden Hoffnungen der berühmte Adolph Quetelet im Jahre 1853 den ersten internationalen statistischen Congreß in Brüssel eröffnete; man wußte, wie sehr die amtliche und wissenschaftliche Statistik auf allen folgenden acht Congressen immer gefördert wurde, welchen Einfluß die internationale statistische Permanenz-Commission in den Jahren 1873, 1874, 1876 und zuletzt 1878 durch ihre Sessionen in Wien, Stockholm, Pest und Paris auf die Fortschritte des Beobachtungsdienstes, auf die persönlichen Beziehungen der Chefs der statistischen Bureaux, auf die Herausgabe vergleichender Publicationen und auf die Hebung der Wissenschaft selbst genommen hatte; und es war allbekannt, daß nur eine anscheinend geringfügige Bestimmung in dem Entwurfe eines neuen Statuts der statistischen Permanenz-Commission der Erneuerung dieser Versammlungen ein unerwartet rasches Ende bereitet hatte. Von allen Seiten wurde daher die Gelegenheit freudig begrüßt, welche zur Wiederaufnahme der gemeinsamen internationalen Arbeiten geboten wurde, und diese Strömung machte sich so deutlich fühlbar, daß auch die Statistische Gesellschaft in Paris nachträglich in ihr Programm einen Punkt einbezog, welcher das „Project der Gründung einer internationalen Permanenz-Commission" betraf. Es gereicht Oesterreich zur Ehre, daß sich das Präsidium der Statistical Society an einen Ihrer Landsleute, Professor v. Neumann-Spallart, mit der Aufforderung wendete, den Bericht über die Erfolge der früheren statistischen Congresse und einen Antrag in Betreff der Gründung einer internationalen statistischen Körperschaft vorzulegen, und daß man so den wichtigsten Punkt des Programmes dessen Händen anvertraute.

Schon die Versammlungen in Paris, welche leider viel zu weitläufig auf die Dauer von vier Tagen ausgedehnt waren, boten mannichfachen Anlaß, um über den Plan der Begründung einer internationalen Association einen gegenseitigen Gedankenaustausch einzuleiten und dem Wunsche des Gelingens sowol in der Eröffnungsrede des Präsidenten M. Léon Say als auch in den Toasten des officiellen Banketts warmen Ausdruck zu leihen. Léon Say insbesondere betonte in seiner Rede, daß eine Menge von Vorurtheilen beseitigt würde, wenn es möglich wäre, ein gutes System der internationalen Statistik zu organisiren. In London hatte man den ursprünglich in Aussicht genommenen zwei Verhandlungstagen einen dritten lediglich zu dem Ende hinzugefügt, um der Discussion und Beschlußfassung über diese wichtigste praktische Frage die erforderliche Zeit einzuräumen. Die hiesigen Journale bereiteten die öffentliche Meinung gebührend auf die Verhandlungen der Statistical Society vor, und namentlich die Times brachte einen langen Artikel, in welchem sie sagte, „es sei zwar aussichtslos, zu erwarten, daß die Directoren der statistischen Bureaux der verschiedenen Länder Europas mehr als einen Theil ihrer Aufmerksamkeit der Herstellung einer internationalen Statistik widmen könnten, dagegen sei es zu hoffen, daß die Discussion über Dr. Neumann-Spallart's Bericht zeigen werde, daß die Meinung der statistischen Fachmänner, welche in Burlington-House dem von der Universität London der Statistical Society für ihr Jubiläum eingeräumten Versammlungs-Amphitheater, tagen, die Errichtung eines „Central-europäischen statistischen Amtes" aufs kräftigste begünstige; es sei nicht anzunehmen, daß es große Schwierigkeiten bereiten würde, die für diesen Zweck erforderlichen Fonds aufzubringen, wenn die Sache nur richtig in die Hand genommen wird."

In gleicher Weise schloß der Präsident der Statistical Society, Sir Rawson, seine überaus gehaltvolle und gediegene Begrüßungs-Adresse am ersten Verhandlungstage mit den Worten, daß die Vereinigung so vieler hervorragender Statistiker und Chefs der statistischen Bureaux bei diesen Jubiläen das Mittel an die Hand geben werde, einen praktischen Plan für die internationale Cooperation in der Sammlung officieller statistischer Daten und in der Förderung der statistischen Wissenschaft auszuarbeiten. Es folgten Vorträge von J. S. Jeans über die Gleichförmigkeit der Statistik, von J. Körösi über die Nothwendigkeit, die Bearbeitungen des Census international vergleichbar auszuführen, und schon alles dies bot Anlaß, um den Hauptzweck der Versammlung zu fördern. Endlich wurde bei dem officiellen Diner, welches die Statistische Gesellschaft am Abende des zweiten Verhandlungstages im Saale des Criterion mit dem reichsten Aufgebote veranstaltete und dem auch die beiden österreichischen Repräsentanten, die Hofräthe Inama und Neumann beiwohnten, unmittelbar nach den Toasten auf die Königin von England und den Prinzen von Wales ein solcher von M. Giffen auf das Gelingen der „internationalen Statistik" gebracht, welchen Dr. Neumann-Spallart unter allgemeiner Zustimmung beantwortete.

Sie sehen, wie geschickt dasjenige vorbereitet war, was die Statistical Society als hervorragendstes und dauerndes Erinnerungs-Zeichen ihres Jubiläums durchzuführen beabsichtigt hatte. Die Verhandlung über diesen Gegenstand nahm daher ganz den erwünschten raschen und günstigen Verlauf. Am Vormittag des letzten Meetings, am 24. Juni, erstattete Dr. Neumann-Spallart sein Referat, welches sich in ausführlicher Darstellung bereits gedruckt in den Händen der Versammlung befand und dessen Schlußfolgerungen von Hofrath Inama unterstützt wurden. Die General-Debatte führte nach dem Antrage des Dr. Mouat und M. Hendriks zur Wahl eines engeren Comités, welches noch am selben Tage an die Vollversammlung die definitiven Anträge erstattete, die im Wesentlichen auf die Annahme des nur in einzelnen Details amendirten Statuten-Entwurfes des Berichterstatters lauteten. Diese Annahme erfolgte einstimmig unter lauten Cheers der Versammlung.

Das Institut international de Statistique wurde als eine internationale Gesellschaft gegründet, deren Zweck ist, den Fortschritt der administrativen und wissenschaftlichen Statistik zu befördern: 1. durch Einführung der möglichsten Gleichförmigkeit der Methoden, Tabellen und Darstellungen der statistischen Erhebungen, sowie insbesondere durch Anbahnung der Vergleichbarkeit der in den verschiedenen Ländern erhaltenen Resultate; 2. durch Anregung der Aufmerksamkeit der Regierungen in Betreff solcher Fragen, welche sich durch statistische Beobachtungen lösen lassen und bisher entweder gar nicht oder nur unvollständig von der Statistik behandelt werden; 3. durch Herausgabe internationaler Publicationen, welche beständige Beziehungen zwischen den Statistikern aller Länder herzustellen geeignet sind; endlich 4. überhaupt durch Verbreitung des statistischen Wissens und Erhöhung des Interesses für die Statistik in den Kreisen der Regierungen und des Publicums.

Als internationale Publicationen sind vorläufig eine Vierteljahresschrift (Bulletin trimestriel) und ein internationales statistisches Jahrbuch (Annuaire) in Aussicht genommen. Die Mitglieder des Institut international de Statistique werden auf die Zahl von hundert als Maximum beschränkt und aus den Chefs und Mitgliedern der amtlichen Bureaux oder Commissionen, sowie den Mitgliedern der statistischen Gesellschaften und Gelehrten gewählt. Außer den wirklichen Mitgliedern werden in gleich beschränkter Anzahl Associés, d. i. correspondirende Mitglieder und mit strengster Kritik auch eine geringe Anzahl von Ehrenmitgliedern gewählt. Das Bureau dieses Instituts besteht aus einem Präsidenten, zwei Vice-Präsidenten und einem General-Secretär; dieselben fungiren stets von dem Ende der einen bis zur nächsten Session, und das Institut hat dort seinen Sitz, wo der jeweilige General-Secretär sein Domicil hat; alle zwei Jahre findet eine Session abwechselnd in den verschiedenen Städten Europas statt.

Auf Grund dieser in den wesentlichsten Grundzügen mitgetheilten provisorischen Statuten erfolgten in London sogleich die ersten, auf etwa fünfzig bis sechzig Persönlichkeiten beschränkten Wahlen, indem der nächsten

Session die Ergänzungswahlen nach reiflichen Vorschlägen vorbehalten bleiben sollten. Wie Sie schon wissen, ist Oesterreich-Ungarn sowol unter den Mitgliedern hervorragend berücksichtigt als auch im Präsidium vertreten. Da es sich darum handelte, die ersten praktischen Durchführungen in eine auf dem Gebiete der internationalen Statistik durchaus bewährte Hand zu legen, wurde die Einladung L. Bodio's, des General-Directors der italienischen Statistik, die erste Session in Rom abzuhalten, mit größtem Applaus begrüßt und einstimmig dankend angenommen. Es läßt sich auch kaum eine zweite Persönlichkeit unter den europäischen Statistikern nennen, welche sich ungetheilt so allgemeiner warmer Sympathien erfreut, wie Bodio, dessen Arbeiten zu den bedeutendsten der Gegenwart gehören; und ebenso erscheint Italien als eine glückliche Wahl für den Ort der ersten Session, weil die italienische Regierung diejenige ist, welche mit den umfassendsten Mitteln und dem größten Interesse schon seit einer Reihe von Jahren die internationale Statistik pflegt. Da sich unter den anwesenden Mitgliedern zwölf europäische Staaten vertreten fanden, scheinen wirklich die ersten Keime einer neuen Institution als Ersatz der unhaltbar gewordenen Congresse gelegt. Die Statistical Society hat sich durch die vortreffliche Vorbereitung der ganzen Angelegenheit und durch den hingebenden Eifer, mit welchem die Mitglieder des Comités, besonders der Präsident Sir Rawson und Foreign Secretary M. J. B. Martin, das Jubiläum zu organisiren verstanden, die größten Verdienste um diese Institution erworben.

„Allgemeine Zeitung," 14. *Juni* 1885.

Wien, 13. Juni. (Internationale Statistik.) Heute haben der Präsident der statistischen Central-Commission, Hofrath Professor Dr. Inama-Sternegg, und das außerordentliche Mitglied dieser Commission, Hofrath Professor Dr. Franz Ritter v. Neumann-Spallart, eine Reise nach Paris und London angetreten, um die Schaffung einer internationalen europäischen Statistik anzubahnen. Den unmittelbaren Anlaß zu dieser Reise bildet die Einladung der Société de Statistique de Paris, welche das Jubiläum ihres 25jährigen Bestandes in der Zeit vom 15. bis 18. Juni feiert, und die Einladung der Statistical Society von London, welche drei Tage später ihr 50jähriges Jubiläum begeht, und welche eben zu diesen Feierlichkeiten den Hofrath Inama-Sternegg als Präsidenten der statistischen Central-Commission und den Hofrath Neumann-Spallart als auswärtiges Mitglied eingeladen haben. Sowohl in Paris als auch in London steht auf der Tagesordnung der Sitzungen, welche natürlich nicht blos Festlichkeiten, sondern auch fachmännischen Discussionen gewidmet sind, eine Berathung über die Schaffung einer internationalen statistischen Commission. In London speciell wird Hofrath Neumann in Folge Aufforderung der Statistical Society ein Referat über diese wichtige und auch politisch höchst interessante Angelegenheit erstatten. Denn in der That

handelt es sich hier nicht so sehr um die neue Errichtung einer solchen Commission, sondern um die Reactivirung einer Institution, welche früher bereits durch viele Jahre existirt und nur in Folge eines zwischen Frankreich und Preußen ausgebrochenen Conflictes sich aufgelöst hatte. Es ist dies der Internationale statistische Congreß, welcher vom Jahre 1853 bis 1876 bestanden und auch in Wien getagt hat. Als dieser Congreß im Jahre 1876 den Beschluß faßte, daß eine ständige internationale statistische Commission eingesetzt werde, welche in Paris ihren bleibenden Sitz haben solle, da protestirte Bismarck gegen diesen Beschluß und verbot ausdrücklich den Statistikern Preußens, sich an diesem Congreß noch fernerhin zu betheiligen. In Folge dessen nahmen auch die andern deutschen Staaten nicht mehr an diesem Congresse theil, welcher seither, wenn auch formell noch weiter bestehend, keine Thätigkeit mehr entwickelte. Aus Anlaß der Jubelfeier der genannten Gesellschaften von Paris und London wurde die Reactivirung des Congresses oder eines ähnlichen Institutes wieder auf's Tapet gebracht und Oesterreich fiel die ehrenvolle Aufgabe zu, in dieser etwas zerfahrenen Angelegenheit die Vermittlerrolle zwischen dem Deutschen Reiche und den übrigen Staaten Europas zu übernehmen. Es wurde daher von der englischen Gesellschaft ein österreichischer Statistiker, nämlich, Hofrath Neumann-Spallart, aufgefordert, das Project eines internationalen Institutes für Statistik auszuarbeiten, welches er den deutschen Staaten, respective den Statistikern ermöglicht, an demselben theilzunehmen. Hofrath Neumann hat dieses Project ausgearbeitet, welches in deutscher, französischer und englischer Sprache abgefaßt ist und darauf hinausläuft, daß an Stelle des einstigen Congresses ein internationales Institut für Statistik treten solle, welches ähnlich wie das bekannte internationale Institut für Völkerrecht organisirt sein und aus einer freien Vereinigung der hervorragendsten Statistiker Europas bestehen wird.

Beilage zur „Allgemeinen Zeitung."

Die Festtage der Société de Statistique in Paris und der Statistical Society in London.

London, 23. Juni. — In London hat die Statistical Society zu ihrem 50jährigen Jubiläum ein wahrhaft internationales Fest vorbereitet. Die Werthschätzung, deren sich die Vertretungen fremder Länder hier erfreuen, kann schon daraus beurtheilt werden, daß Earl of Granville, trotzdem daß er nur noch mit einem Fuße im Cabinette steht und sich leicht hätte entschuldigen können, dennoch die Festgäste gleich am ersten Tage in seinen glänzenden Appartements in Carltonhouse-Gardens empfing, wobei dieselben auch der Gräfin Granville vorgestellt wurden. Etwas später fanden sie sich im Mansionhouse beim Lord Mayor zum Lunch ein, wo die Begrüßungstoaste ausgetauscht wurden.

Bedeutsam war die Ansprache des ehrenwürdigen Präsidenten der Gesellschaft, Sir W. Rawson, welcher, da er im Jahre 1836 Secretär der Gesellschaft wurde, sein eigenes Jubiläum mitfeierte. Er begrüßte zuerst

die fremden Vertreter. Als solche waren erschienen: Aus Oesterreich-Ungarn Hofrath v. Inama-Sternegg, Ministerialrath Keleti, Hofrath v. Neumann-Spallart, Professor Hunfalvy, Director Köröfi und Erben. Aus Belgien Präsident General Liagre; aus Brasilien der Gesandte Baron de Penedo; aus Frankreich de Foville, Levasseur, Lona, Bertillon, Bourgeois, Chervin, der Prinz Roland Bonaparte, Chotteau, Cottin, Hennequin, Juglar, Liégeard, Malarce, Robyns, Turquan; aus Griechenland Argyropulos; aus Holland Baron Verschuer; aus Italien Bodio und Perozzo; aus Norwegen Kiaer; aus Rumänien Prinz Jon Ghika; aus Rußland Bourtourline, Kaufmann und Troinitzky; aus den Vereinigten Staaten General Walker und Andere.

Der Präsident gedachte des Herzogs von Albany, durch dessen Tod das Jubiläum um ein Jahr verschoben wurde, sowie der verstorbenen Mitglieder. Insbesondere fand die Erinnerung an den ersten Ehrenpräsidenten, den Prince Consort, sowie an den „Nestor der internationalen Congresse," Quetelet, lebhafte Zustimmung. Sir W. Rawson machte auf die bevorstehenden internationalen Vereinbarungen aufmerksam.

Uebergehend zu Gegenständen außerhalb des Programmes kam er auf die wichtige Streitfrage über die Statistik als Wissenschaft zu sprechen und betonte, daß jetzt die Gelegenheit vorhanden wäre, etwas Entscheidendes darüber festzusetzen. Die im positiven Sinne von Dr. Guy entschiedene Frage hatte neuestens wieder durch M. Hooper und Prof. Ingram Angriffe zu erdulden, indem insbesondere letzterer bei seiner Rede als Präsident der statistischen Abtheilung der British Association in Dublin den Ausspruch that: „es sei unmöglich, der Statistik den Charakter einer Wissenschaft zu vindiciren."

Sir W. Rawson wies aber sehr richtig auf die Analogie mit der Astronomie hin, worunter wir die Wissenschaft von den Himmelskörpern verstehen, sowie mit der Geologie, welche die Zusammensetzung und Structur der Erde lehrt, und der Botanik, welche uns dasselbe von den Pflanzen besagt. Ebenso sei die Statistik die Wissenschaft, welche von der Structur der menschlichen Gesellschaft handelt.

Dabei stimmen wir mit Sir W. Rawson vollkommen überein, wenn er die Definition des französischen Handelsministers mißbilligt, welcher von der „in Ziffern ausgedrückten Wissenschaft der socialen Glieder" sprach. Wir müssen die Statistik für mehr als eine Reihe von Zahlen und Tafeln nehmen. Und wir freuen uns über die scharfe Zurückweisung seiner Ansicht durch den Präsidenten, indem er sagte, er könne nicht billigen, daß man die Statistik zur Dienstmagd der „Socialwissenschaft" mache. Der Vater dürfe nicht zum Holzfäller und Wasserträger seines eigenen Sprößlings werden. (To degrade the parent into the position of a hewer of wood and drawer of water in the service of its own offspring.)

Als Methode sei die Statistik von secundärem Charakter, ähnlich wie man die Arithmetik auch zum Zählen gebrauche.

Es sei uns gestattet, unserer Freude über die Entschiedenheit auszusprechen, mit welcher Sir W. Rawson die Unterordnung der Statistik unter die sogenannte „Sociologie" zurückwies. Dieser neue Name, der nur dazu dient, verschiedenen unklaren Begriffen den Schein eines präcisen Ausdruckes zu geben, wird völlig entbehrlich sein, wenn man die Ehrlichkeit besitzt, den Dingen ihren Namen von dort zu geben, woher man sie ohne klares Bewußtsein zusammengetragen hat.

Sir W. Rawson empfahl die jetzige Gelegenheit, um von der Regierung ein Centralbureau zu verlangen, und zwar (wie in Frankreich unter dem Handelsministerium) dem Board of Trade und nicht der Treasury untergeordnet.

Ferner sprach der Präsident den Wunsch eines internationalen Austausches der Publicationen aus und schloß mit dem Ausdrucke der Befriedigung darüber, daß es möglich war, dieses Jubiläum an die Pariser Jubelfeier anzureihen, wodurch viele hervorragende ausländische Statistiker sich zum Besuche der Feste bewogen fanden.

Die Begrüßung erwiderten von den fremden Vertretern Director Bodio, in Vertretung von Correnti und Messedaglia, den Hofrath v. Inama-Sternegg, während Hofrath v. Neumann-Spallart einen Brief und Glückwunsch des Seniors der österreichischen Statistik, des Frhrn. v. Czoernig, vorlegte.

Dr. F. Mouat entwarf sodann ein Bild von der Geschichte der Gesellschaft. Wir möchten den Gedanken, daß in der Anerkennung und Werthschätzung der Statistik durch den Staat die Zukunft derselben gelegen sei, manchen europäischen Regierungen zur Beherzigung empfehlen. Nicht nur als Wissenschaft, sondern als wichtige Stütze der Staatsgewalt, der Gesetzgebung und der Verwaltung pries Dr. Mouat die Statistik, und wir glauben, daß die Zeit kommen wird, wo die Regierungen den praktischen Werth der Statistik, wenn schon nicht ihren wissenschaftlichen, so sehr einsehen werden, daß ein gewisser Wetteifer in der Pflege der Statistik zwischen den einzelnen Staaten entstehen wird.

Nachdem Major Craigie eine Abhandlung von Dr. Guy über die „Statistik als Wissenschaft" vorgetragen hatte, sprach noch de Foville über das Thema „la statistique et ses ennemis." Der Gedanke war, kurz gesagt, der, daß weder die Spötter, welche die Statistik in Frankreich bereits allgemein in das Lustspiel gebracht haben, noch die Indolenten, welche stets die Achseln zucken, „à quoi bon?" noch die Mameluken, welche die gottbegnadete Ordnung der Dinge nicht näher untersuchen wollen, die eigentlichen Feinde der Statistik sind. Für ihre größten und wahren Feinde hält de Foville die schlechten Statistiker. Jeder dritte Mensch fühlt sich heute berufen Statistik zu treiben, ebenso wie jeder die Politik zu verstehen glaubt, wenn er auch sonst für das einfachste Handwerk einen Befähigungsnachweis verlangt.

Durch die gewissenlosen und unfähigen Statistiker werde die Statistik des Vertrauens der öffentlichen Meinung beraubt. Es sei gegen diesen

Mißbrauch anzukämpfen. Namentlich habe man gegen die Manie scharf vorzugehen, die heute alle auf- oder absteigenden Curven von Ereignissen in Causalnexus zu bringen bestrebt ist, und welche Bücher fabricirt, wie z. B. das „sur l'influence de la pomme de terre sur les révolutions" und andere.

Dieser an Geistreichigkeiten nicht arme Essay war zwar ziemlich verschieden von den anderen Vorträgen; aber nach der langen Reihe von schweren Gerichten, welche uns von den Engländern gleich am ersten Tage vorgesetzt wurden, wirkte diese Causerie wie ein Gläschen Cognac oder „l'amande verte" in Paris. „Cela fait la digestion," fügen mit väterlicher Miene erklärend die Franzosen hinzu.

London, 24. Juni. — Der zweite Sitzungstag war höchst interessanten Vorträgen gewidmet. Da ein näheres Eingehen auf dieselben jedoch den Raum überschreiten würde, sei uns ein kurzer Bericht darüber gestattet.

Hr. Giffen fand in seinem Vortrage als einen der größten Vortheile der Statistik, daß sie Staatsmännern und Politikern, sowie überhaupt der allgemeinen Erwägung und Discussion Probleme von tiefster Bedeutung an die Hand gebe, die ohne statistische Forschung kaum zu Tage treten würden.

Er versuchte, nach verschiedenen Tafeln das Anwachsen der „europäischen Race" auf der Erde näher zu betrachten. Seit hundert Jahren, wo die europäische Bevölkerung sich auf etwa 145 Millionen bezifferte, seien 205 Millionen zugewachsen, so daß wir heute 350 Millionen zählen. Da in Indien, China, Afrika und Amerika die Bevölkerung sich nicht in dem Maße vermehrte, müsse man, wie immer das Verhältniß der europäischen Bevölkerung vor hundert Jahren war, auf eine bedeutende Vermehrung des europäischen Uebergewichts für unsere Tage schließen. Dazu kommt aber noch die außerhalb Europa's befindliche europäische Bevölkerung von etwa 70 Millionen, so daß sich die Ziffer auf 420 Millionen stellt, welche, wenn das Maß des Anwachsens gleich bleibt, in weiteren hundert Jahren die 1,000 Millionen überschritten haben wird. Er ging dann auf das entsprechende Steigen des Reichthums über und fand es wichtig, zu untersuchen, ob dasselbe bloß durch eine Vermehrung des Reichthums weniger Reicher entstanden sei, wie dieß von den Socialisten behauptet werde. Nur der Statistiker könne sich darüber ein Urtheil bilden, meinte Hr. Giffen. Diesem zeige sich jedoch ein Steigen der Löhne um 50, ja oft um 100 Procent gegenüber dem Beginne unseres Jahrhunderts. Diesem zeige sich ferner das riesige Anwachsen der Bevölkerung, das nur bei einem gleichen Wachsen der Subsistenzmittel denkbar sei. Gerade in den Colonien, wo die ärmste Classe und die ganz unqualificirte Arbeitskraft sich niederlasse, erscheine dieses Anwachsen am stärksten. Ebenso zeige sich das großartige Anschwellen der Städte, wohin ein höherer Erwerb die Leute lockt.

Daß die niedersten Arbeitskategorien abnehmen und die qualificirteren Gewerbe aufsteigen, lasse auch auf eine Verbesserung der socialen Verhältnisse schließen. Aus einer Tabelle über die Hauszinssteuer schließt Giffen

auf eine riesige Vermehrung der obersten Classe, die heute der ehemaligen Gesammtbevölkerung entspreche. Die dann folgenden höheren Gewerbetreibenden, Farmer, Kaufleute, seien in viel besserer Lage, als der ehemalige sogenannte Mittelstand. Es kommen dann die Arbeiter, denen es besser gehe als den Armen der früheren Zeit, und endlich die letzte mittellose Classe, die ungemein gering sei. Hr. Giffen findet ein großes Mißverständniß bei den socialistischen Schlüssen. Man sage z. B., daß England 1,200,000,000 Pfd. Sterling producire. Dieß vertheile sich unter einige Reiche und die Arbeiter hätten nichts davon. Doch zeigen die einzelnen Tafeln der Income-tax, daß jene, welche einen Antheil verlangen, gerade Beitragende in der betreffenden Classe der Income-tax sind, nicht etwa das Proletariat. Die Ausweise zeigen, daß jeder den Werth im Lohne erhalten hat, den er dann wieder an den Arzt, Advocaten ꝛc. weitergab, so daß, wenn ein Arbeiter mehr verlangte, dieß wieder nur hieße, daß er es einem anderen Arbeiter wegnehmen wolle. Es sei eine Illusion und ein Traum der Socialisten, immer von einem fictiven Fonds zu sprechen, der im Lande producirt werde und von dem sie ausgeschlossen würden; ihre Antheilnahme findet eben durch den Austausch von Leistung und Gegenleistung in kleinen Gruppen statt, während diese gewisse Gesammtsumme, welche „producirt" würde, eine imaginäre sei.

Uns scheint diese Erörterung, die einen gewissen Schein der Exactheit durch Induction an sich trägt, voll von Trugschlüssen und vagen Behauptungen. Die Engländer bleiben, da die irische Frage noch nicht den Charakter der continental-socialen angenommen hat, und sie mitunter dieselbe noch durch Ironie zu lösen glauben, zäh an ihren überlebten Theoremen haften. Es erinnert an den Vogel Strauß, wenn sich ein so gelehrter Herr bis über die Ohren in die „Schedules" der Income-tax vergräbt und dann, blind gegen das, was auf dem Continent geradezu die Lebensaufgabe der größten Staatsmänner bildet, sagt: Ego autem censeo, die socialen Verhältnisse bessern sich von Tag zu Tag.

Hr. Jeans stellte als vorzügliche Wünsche für die Erreichung einer Gleichförmigkeit in der Statistik auf: 1. Eine Uebereinkunft darüber, welche Daten gesammelt; 2. wie dieselben einheitlich erhoben; und 3. in einheitlich systematischer Weise zusammengestellt werden sollten; er verlangte 4. die Einführung des Kalenderjahres; und 5. des metrischen Systems für alle statistischen Erhebungen.

Der Registrar-General for Ireland, Hr. Grimshaw, konnte nicht umhin, einem kleinen Häufchen von Irländern zu Gefallen, die Abneigung zu tadeln, welche sich in England bei Erhebungen über das religiöse Bekenntniß zeige, wobei man in Irland keinerlei Schwierigkeiten habe. Ebenso sprach er seine Bewunderung über die Promptheit aus, mit welcher in Irland trotz der Landagitation Daten für die Agrarstatistik geliefert würden. In den wenigen Fällen, wo Angaben der Polizei verweigert wurden, hat man sie den Regierungsbeamten dann bereitwilligst ertheilt. Eine etwas lebhaftere Discussion über diese politischen Anspielungen wurde

durch die Umsicht des Präsidenten Sir W. Rawson vermieden. Hr. Chadwick und Major Craigie nahmen an der Discussion theil, wobei letzterer besonders im Interesse der Agrarstatistik den Wunsch aussprach, daß endlich das Gewicht anstatt des Maßes zur Grundlage genommen werde, zumal die Farmer auch schon nach dem Gewichte zu verkaufen beginnen.

Director Köröſi entwarf in einer höchst verdienstvollen Arbeit eine Zusammenstellung über die für einen Census unbedingt nöthigen Gleichförmigkeiten der Erhebung, um endlich vergleichbare Daten zu haben. Es sei bis jetzt so viel Rücksicht auf die einzelnen Fragestellungen genommen worden, daß man ein gleichartiges System übersah. Es sei endlich wünschenswerth, daß beim nächsten Census eine Vergleichbarkeit der Angaben über Alter, Geschlecht, Civilstand, Bildung, Beruf ꝛc. ermöglicht werde.

General Walker, gewiß der erfahrenste Fachmann auf diesem Gebiete, sprach nebst dem Danke für diese Anregungen die Ueberzeugung aus, daß auch ohne Appellation an die Regierungen schon vielfach durch Zugeständnisse der Statistiker in dieser Beziehung manche Erfolge erzielt werden können.

Die Professoren Edgeworth und Marshall legten, wie Fachmänner erklärten, sehr werthvolle Arbeiten auf dem Gebiete der mathematischen Statistik vor. Da dieß sehr ausführliche Monographien mit einer Unsumme von Zahlen, graphischen Darstellungen und höheren mathematischen Entwicklungen sind, ist es noch nicht möglich, ein Urtheil darüber abzugeben, zumal uns dieses Gebiet etwas ferner liegt. Professor Marshall hatte sich namentlich mit historischen Curven beschäftigt. Daß Professor Edgeworth sogar ein mathematisch-statistisches Gesetz über den Daktylus in den Hexametern der Aeneide $\left(\sqrt{1.\mathfrak{C}\left\{\frac{1}{0.9}+\frac{1}{N}\right\}}\right)$ entdeckt hat, mag in den Augen der Mathematiker quand même als großes Verdienst erscheinen. Wir gestatten uns den Wunsch auszusprechen, daß die mathematischen Statistiker, wenn sie sich schon an solchen disjecta membra poetae zu ergötzen im Stande sind, diese Probe ihres guten Geschmackes mehr im Dunkel der Studierstube belassen möchten.

Professor Levasseur vom Collège de France sprach über die graphischen Darstellungen. Der berühmte Professor, der bekanntlich die Statistik in bonne, médiocre et mauvaise eintheilt, sagte uns nicht viel Neues. Trotz unserer Freude über manche sehr dramatische Stellen seines Vortrages fanden wir es ziemlich allgemein verständlich, daß die Vergleichung der verschiedenen Punkte einer Reihe von Erscheinungen unter einander durch die Graphik bequemer gemacht wird, während die Berechnung, Vergleichung und Combination bloßer Zahlenreihen das Marcante der Erscheinung nicht so rasch und leicht zur Auffassung bringt. Oder hätten wir damit unseren geschätzten Lesern etwas Neues gesagt?

Abends war Jubiläumsdinner im Criterion. Der Präsident toastirte auf die Königin, Hr. Shaw-Lefèvre auf den Prince of Wales, den

Ehrenpräsidenten der Gesellschaft; Hr. Giffen brachte das Wohl der „Internationalen Statistik" aus, wobei er den hübschen Gedanken ausführte, wie es oft möglich sei, durch statistisch festgestellte Thatsachen in einem Lande die Erscheinungen in einem anderen zu erklären, oder doch wenigstens auf deren Untersuchung hingelenkt zu werden.

Sir J. Caird trank der Schwestergesellschaft in Paris zu, wofür Levasseur dankte, indem er für die französische Gesellschaft mehr die Stellung einer Tochter denn einer Schwester in Anspruch nahm.

Endlich brachte Lord Fitzmaurice die Gesundheit der fremden Gäste aus. Die mit großer Heiterkeit aufgenommene Bemerkung, daß man zur Unterhaltung der Gäste in London alles gethan, ja sogar ihnen zu Ehren eine Ministerkrisis veranstaltet habe, zeigte die Laune eines Mannes, der eben von einer ungeheuren Verantwortlichkeit entlastet wurde. Le cabinet est mort, vive le cabinet!

London, 25. Juni. — Gestern fand also die letzte Sitzung statt und wir dürfen es mit großer Befriedigung constatiren: in der That war das Beste und Wichtigste für den letzten Tag gespart worden.

Das Jubiläum der Statistical Society hätte wohl nicht würdiger geschlossen werden können als mit der Gratulation des greisen Präsidenten, der die Versammlung zu der Geburt eines Kindes beglückwünschte: des des „Institut international de Statistique." Allerdings müssen wir den Wunsch beifügen, daß dieses Institut auch ein lebensfähiges Kind sein möge. Um ein Urtheil darüber zu gewinnen, sei uns gestattet, vorerst den Verlauf der für alle Zeiten denkwürdigen Sitzung zu skizziren.

Auf der Tagesordnung stand der Vortrag des Hofraths v. Neumann-Spallart über die „Erfolge der internationalen statistischen Congresse 1853 bis 1876 und Vorschläge zur Gründung eines Institut international de Statistique."

Hofrath v. Neumann-Spallart warf in seinem Vortrage, mit dem er sich für die Gewinnung einer Basis der internationalen Vereinbarungen gewiß große Verdienste erworben hat, einen Rückblick auf die Geschichte der statistischen Congresse.

Er sprach zuerst von der Nothwendigkeit internationaler Vereinbarungen in der Statistik überhaupt. Während der Astronom auf seiner Sternwarte, der Chemiker in seinem Laboratorium, der Physiolog vor dem organischen Körper allein und ohne fremde Beihülfe die wichtigsten Forschungen anstellen könne, sei der Statistiker immer auf die Mitwirkung eines Heeres von Beobachtern angewiesen, um den „corps social" zu untersuchen. Es gebe nun zwar eine Meinung, welche in der Ausdehnung des Beobachtungsfeldes eine Trübung der Resultate erblicke; doch diese sei falsch. Allerdings habe jedes Volk seinen Typus, aber dieser werde erst meßbar, wenn er mit anderen Typen und mit großen Mittelwerthen verglichen wird. Ueberdieß seien die Landesgränzen oft ganz künstliche, weßhalb die beschränkte Beobachtung die Richtigkeit der Resultate beeinträchtige.

Professor v. Neumann-Spallart schloß diese Einleitung mit dem Ausspruche, daß es Pflicht jedes Statistikers sei, die internationalen Vereinbarungen nach Kräften zu fördern. Er sei überzeugt, daß dieß allen Anwesenden klar sei, aber er sage es mit allem Nachdruck Jenen, die durch ihre Abwesenheit eine andere Anschauung zu bekunden schienen.

Wir sind damit sehr einverstanden; wenn nur Hr. Hofrath v. Neumann nicht im Folgenden sich so sehr über Jene hinweggesetzt hätte, denen er hier seine wohlgemeinten Rathschläge ertheilte!

Uebergehend zur Geschichte drückte der Redner seine Freude darüber aus, daß gerade an derselben Stelle, in London, vor 34 Jahren während der Ausstellung die ersten Keime zu den internationalen Vereinbarungen entstanden. Doch erst 1853 kam der erste eigentliche Congreß in Brüssel zu Stande. Während von diesem nur allgemeine Impulse zur Verbesserung der statistischen Forschung ausgingen, sprach Baron v. Czörnig auf dem folgenden Congresse 1855 in Paris schon die bestimmte Forderung von statistischen Centralcommissionen für die einzelnen Staaten aus, wodurch die Unterstützung der wissenschaftlichen durch die amtliche Statistik (worauf Hofrath v. Neumann hier sehr viel Werth legt) wesentlich gefördert wurde.

In der dritten Session zu Wien 1857 tritt der Wunsch eines engeren Anschlusses der eigentlichen Fachmänner in der Schaffung eines Avant-Congrès, der alle Fragen vorbereitet, zu Tage.

Der vierte Congreß in London 1860 erhielt seine besondere Weihe dadurch, daß der Präsident, Prinz Albert, sich in seiner Eröffnungsrede über die anerkannte Unentbehrlichkeit internationaler statistischer Vereinbarungen aussprach. Eine gleiche Lobrede auf den Werth der vergleichenden Statistik hielt Dr. Engel beim fünften Congresse in Berlin 1863. Schon damals trat der Wunsch hervor, den Schwerpunkt der Abstimmung auf die sachverständigen Mitglieder zu legen und fand seinen besonderen Ausdruck auf dem Congresse von Florenz 1867, wo der Avant-Congrès der eigentliche Träger des ursprünglichen Gedankens wurde, während man in den Vollversammlungen lange überflüssige Reden hielt. Einen neuen Aufschwung nahm die Congreß-Idee auf dem Congresse im Haag 1869. Nach den von Baumhauer verfaßten Idéesmères lag der Schwerpunkt im Avant-Congrès, von dem die fruchtbringendsten Anregungen für die Methodologie und Darstellung in der Statistik ausgingen. Die wichtigste Errungenschaft dieses Congresses ist aber der Plan zur Herausgabe eines großen Werkes der internationalen vergleichenden Statistik, dessen Theile dann nach Engels Antrag auf die einzelnen statistischen Bureaux vertheilt wurden. Der achte Congreß in St. Petersburg sprach das internationale Programm der Volkszählungen aus und errichtete eine permanente Commission aus fachmännischen Mitgliedern, die später eine so unglückliche Rolle spielen sollte. Diese Commission hielt ihre Sessionen im Jahre 1873 in Wien, 1874 in Stockholm und 1876 in Pest, wo sie den neunten Congreß einleitete.

Nun kam die denkwürdige Session der Permanenz-Commission in Paris 1878. Man suchte nach einem von dem Präsidenten Keléti aus-

gearbeiteten Entwurfe das Institut der Permanenz-Commission selbst weiter auszubilden. Die Congresse sollten nur noch für die Anregung des großen allgemeinen Interesses an der Statistik wirken. Man dachte sich einen officiellen Verkehr zwischen den Vorständen der statistischen Bureaux und der Permanenz-Commission, wobei die ersteren von letzterer gewisse Aufträge erhalten und zur Beantwortung von Fragen verpflichtet sein sollten. Die Mitglieder der Permanenz-Commission sollten das Reglement baldigst ihren Regierungen unterbreiten, und man sprach es ganz offen aus, daß die Zustimmung der Mehrzahl der Regierungen genügen würde, um die Beschlüsse der Permanenz-Commission zu definitiven zu machen.

Damit war der Karren verfahren. Sofort trat der Widerstand des Deutschen Reiches, und mit Recht, hervor; man weigerte sich, Verpflichtungen zu übernehmen, deren Durchführung in Paris abgemacht werden sollte, und im Jahre 1879 vertagte sich endlich die Permanenz-Commission in Rom auf unbestimmte Zeit.

Seither haben leider alle Verhandlungen geruht. Wir mußten uns daher über den Gedanken freuen, dem Hofrath v. Neumann Ausdruck verlieh, und der gewiß ein allgemeiner war: nichts ist geeigneter, eine internationale Vereinbarung, wenn eine solche überhaupt möglich ist, wieder anzubahnen, als das Jubiläum der Statistical Society in London.

Bei der Erwägung, welche Form der Vereinbarung zu wählen sei, erschienen drei Möglichkeiten. Einmal konnte man eine Institution mit gänzlich officiellem und autoritativem Charakter schaffen. Eine solche hielt der Referent mit Recht dermalen für unmöglich. Oder man konnte eine halbofficielle Institution schaffen. Dieß war schon wegen der Erinnerung an die alte Permanenz-Commission nicht opportun. So blieb denn endlich, wie Hofrath v. Neumann ausführte, nur noch die Möglichkeit einer freien Vereinigung. Als solche denkt er sich das Institut und er hat die Statuten für dasselbe ähnlich denen des Institut de droit International ausgearbeitet.

Sehen wir aber näher zu, so finden wir, daß er sofort gezwungen war, diesen recht schön klingenden Ausführungen einige Einschränkungen beizufügen. Er sagte, die freie Association solle zwar jedes amtlichen Charakters entbehren, aber sich doch „die unerläßlichen Beziehungen zur amtlichen Statistik der einzelnen Staaten sichern." Das ist ein sehr schöner Satz, aber wie soll er realisirt werden? Die Autorität der dem Institut angehörenden Persönlichkeiten werde schon, so meint v. Neumann-Spallart, die nöthige Pression ausüben. Er denkt also offenbar, daß die officiellen Statistiker, welche dem Institute angehören, allmählich einen Einfluß auf ihre Regierungen üben werden. Wir sehen mit Entsetzen die todtgeglaubte Permanenz-Commission wie Banquo's Geist in unserer Mitte erscheinen. Abgesehen nun davon, daß Deutschland ganz klar seine Abstinenz ausgedrückt hat und somit von vornherein ein höchst mangelhaftes Rumpfinstitut geschaffen wurde, müssen wir endlich doch fragen: wie wird sich denn die officielle Statistik diesem Institute gegenüber verhalten?

Dafür gewinnen wir eine Directive, wenn wir den Standpunkt betrachten, welchen Hofrath v. Inama-Sternegg in der Versammlung zu vertreten den Muth hatte. Er war der einzige, der die Stellung der officiellen Statistik, welche sie sich präcisiren muß, auch wirklich präcisirte. Und wahrlich, die Vergangenheit dieses Mannes sichert ihn, wie wir meinen, davor, daß man ihn für einen Bureaukraten halte. Er gab sich einfach in der allgemeinen Festesfreudigkeit, die sich einige Herren nicht trüben lassen wollten, keiner Täuschung hin, indem er in einer Resolution ausführte, daß er das Entstehen eines freien wissenschaftlichen Instituts nach dem Antrage Neumann-Spallarts vollkommen billige und wünsche; daß er aber meine, dieses Institut sei, um praktische Resultate zu schaffen, so sehr auf die Regierungen und ihre Vertreter angewiesen, daß man diesen den Wunsch ausdrücken solle, sie mögen durch unabhängige und rein diplomatische Conferenzen von Zeit zu Zeit ihre Stellung kennzeichnen und Organisationsformen der Statistik feststellen.

Der sehr richtige Gedanke scheint uns dabei folgender zu sein: Wissenschaftliche und amtliche Statistik haben einander bisher in ihrer engen Verbindung stets gestört, statt gefördert. Daher sind sie zu trennen. Das geschieht aber nicht dadurch, daß man die Regierungsstatistik einfach ignorirt, sondern daß man ein separates Arbeiten, eine separate Organisationsform (Institut und Conferenzen) ganz unabhängig von einander zuläßt und erst dadurch eine gegenseitige Befruchtung und Förderung ermöglicht. Hofrath v. Inama-Sternegg schien uns gerade der beste Anwalt der Freiheit des Instituts. Denn nur auf diese Art ist es möglich, dasselbe rein und gewiß auch mit Mitwirkung der deutschen Vertreter zu erhalten.

Nur durch diplomatische Conferenzen der Regierungen ist es aber auch andrerseits für diese möglich, die Frage noch weiter zu ventiliren. Denn wenn auf dem Kampfplatze des Institut bindend Fragen entschieden werden würden, könnten sich diesen Beschlüssen je die Regierungen unterwerfen?

Könnten sie sich von einer Majorität beherrschen lassen, die davon abhängt, ob einige Herren dieses wissenschaftlichen Casino's gerade etwas weiter weg vom Versammlungsorte wohnen oder ob eine interessante Frage auf der Tagesordnung steht?

Woher will aber das Institut sein Material, seine Vorarbeiten, seine praktischen Resultate nehmen, wenn nicht durch die Mithülfe der officiellen Statistik?

Die Versammlung wählte nun ein Comité, bestehend aus den HH. Neumann-Spallart, Bodio, Levasseur, Walker, J. B. Martin, Troinitsky, Kiaer, Argyropulos, Keléte und D. Mouat, welches die Umarbeitung der von Hofrath Neumann vorgeschlagenen Statuten vornahm. Es war in diesem Referate, das Nachmittags der Vollversammlung mitgetheilt wurde, namentlich von einer Vertheilung einer bestimmten Anzahl von Delegirten auf die verschiedenen Länder abgesehen worden. Diese von Hrn. v. Neumann-Spallart ganz willkürlich unternommene Auftheilung der Statistiker der Welt nach seinem Gutdünken hatte schon

Vormittags das Befremden gutbedachter und die Entrüstung vernachlässigter Staaten hervorgerufen.

Auch wurde die Anzahl der Mitglieder auf 100 (statt 80) gesetzt und im Texte der Statuten sorgfältig der Ausdruck „Staat" durch „Land" ersetzt. Man ist sich der Gefährlichkeit des Bodens wohl bewußt, auf dem sich insbesondere die officiellen Statistiker nur mit aller Vorsicht bewegen dürfen, wie dieß auch aus den Briefen hervorgeht, welche einige deutsche Statistiker an Hofrath v. Neumann übersandten, und welche alle den Wunsch aussprechen, das Institut möge „gut organisirt" werden; davon hänge alles ab.

Nach der Wahl der Mitglieder schritt man sofort zur Wahl des Bureau's. Als Präsident wurde Sir Rawson, als Vicepräsidenten Neumann-Spallart und Levasseur, als General-Secretär Bodio, und als Schatzmeister Martin gewählt.

Als Zweck des Instituts bezeichnen die Statuten die Förderung des Fortschritts der administrativen und wissenschaftlichen Statistik dadurch, daß es 1. die größtmögliche Einheit der Erhebungsmethode und der Publicationen einführt; 2. die Aufmerksamkeit der Regierungen auf Fragen lenkt, die statistisch beantwortet werden könnten, und Aufklärungen über Fragen von der officiellen Statistik verlangt; 3. internationale Publicationen ins Leben ruft; 4. die Kenntniß der Statistik und das Interesse der Regierungen und des Publicums zu fördern sucht.

Möge es diese Ziele in vollem Maße erreichen! Möge es namentlich sich klar über die Wege sein, welche einzig ein rückhaltloses Mitarbeiten der officiellen Statistik und einen Anschluß Deutschlands ermöglichen! Dieser Weg wird sich nicht in einem vagen Verquicken von wissenschaftlicher und amtlicher Statistik unter dem Deckmantel einer „freien" Institution finden. Vielmehr wird, wie dieses Hofrath v. Inama-Sternegg so überzeugend ausführte, in der Aufrichtigkeit und Klarheit der Trennung beider Gebiete der richtige Weg gegeben sein.

Clara pacta, boni amici.

Internationale Statistik.

Wie der „Pol. Corr." aus London gemeldet wird, hat die Statistical Society am 24. d. unter Betheiligung der Vertreter von zwölf fremden Staaten, die Gründung eines Institut International de Statistique nach Professor Neumann-Spallart's Statuten-Entwurfe beschlossen. Aus Oesterreich wurden Hofrath Inama-Sternegg, Neumann-Spallart, Brachelli und Lorenz-Liburnau; aus Ungarn: Keleti, Hunfalvy und Köröfi zu wirklichen, dann Baron Czörnig und Professor Kautz zu Ehrenmitgliedern gewählt. Die Constituirung erfolgte unter dem Präsidium von Sir W. Rawson, mit Levasseur und Neumann-Spallart als Vice-Präsidenten, Bodio als General-Secretär. Ueber Einladung Bodio's wird die erste Session im Jahre 1886 in Rom oder Mailand abgehalten werden.

Abstract *of the* Report *of the* "Allgemeine Zeitung" *on the* Jubilee *of the* Statistical Society *of* London.

After mentioning with satisfaction the reception given to the foreign visitors by Lord and Lady Granville, and remarking on the objective character of the London meeting, as shown by the character of the papers read, the "Gazette" gives a summary of Sir Rawson Rawson's Address. With regard to the controversy as to the nature and character of statistical inquiry it mentions Sir Rawson Rawson's dissent from the view of Professor Ingram and others, that "it is impossible to claim for statistics the "character of a science;" and proceeds to say: "Sir Rawson "Rawson rightly referred to the analogy of astronomy, by which "we mean the science of the heavenly bodies, as well as that of "geology, which inquires into the constitution and structure of "the earth, and that of botany, which informs regarding that of "plants. In like manner statistics is a science which deals with "the structure of human society.

"We quite agree with Sir Rawson Rawson when he found "fault with the definition given by the French Minister of Com-"merce, who said that statistics is 'the science of the social body "'expressed in figures.' We consider statistics to be more than "a series of figures and tables; and we approve of the neat "summary of his view given by the President, to the effect that "he would not consent to make statistics the handmaid of social "science, and thus 'degrade the parent into the position of a "'hewer of wood and drawer of water in the service of its own "'offspring.'

"As a method statistics was of a secondary character, just as "one makes use of arithmetic in dealing with figures.

"We must express our satisfaction at the decision with which "Sir Rawson Rawson rejected the subordination of statistics to "'sociology.' This new term, which is only useful in order to "give the appearance of a precise expression to various vague "conceptions, can be entirely dispensed with if people possess the "frankness to name things from the source whence they are "obtained.

"Sir Rawson took the opportunity to demand from the Govern-"ment a central statistical office, which should be subordinated to "the Board of Trade (just as in France it is under the Ministry of "Commerce), and not to the Treasury.

"The President also expressed a wish for an international "exchange of publications, and concluded by saying that he was "glad it had been possible to make the Jubilee a sequel to that "of Paris, and thus secure a visit from many leading foreign "statisticians."

After referring to the replies on behalf of the visitors, the journal proceeds to mention the papers read, and with regard to that of Dr. Mouat commended to the attention of several European Governments the advantage of recognising the value of statistics. "We believe," it says, "that the time will come when the Govern-"ments will so fully perceive the practical use, if not the scientific "value, of statistics that each will vie with the other in their "service."

After referring to Dr. Guy's paper on "Statistics as a Science," read by Major Craigie, and M. A. de Foville's on "Statistics and "its Enemies," the journal concludes its report of the first day's proceedings.

In reporting the proceedings of the second day the journal expresses a strong opinion that the views of English economists on social questions are obsolete. It goes at some length into Mr. Giffen's paper, and comments as follows: "This inquiry, "which carries with it a certain appearance of inductive exact-"ness, seems to us to be full of fallacious conclusions and vague "generalisations. The English adhere obstinately to their worn-"out theories; for the Irish question has not yet assumed the "character of the continental social question, and they think that "the latter can still be solved by irony. We are reminded of "Strauss's bird when so learned a man sinks himself over head "and ears in the schedules of the income tax, and then, blind to "what forms the life-problem of the greatest continental states-"men, says, with an *ego autem censeo*, that the social conditions "are improving daily."

After referring briefly to the other papers read and to the proceedings at the Jubilee Dinner, the report of the proceedings of the second day closes.

The report of the last day's proceedings deals with Professor Neumann-Spallart's paper advocating the establishment of an International Statistical Institute. After summarising the paper, the journal criticises the proposal in a rather hostile spirit. It says: "On considering what form should be chosen for the associa-"tion, there appeared to be three courses possible. It might be an "institution of an entirely official and authoritative character; but "the speaker rightly considered this as at present impracticable. "It might be semi-official; but the experience of the former per-"manent commission rendered this unsuitable. The only possible

" scheme therefore, as Dr. Neumann-Spallart said, was that of an " independent association. He had conceived of the institution in " that manner, and had drafted the statutes for it on the model of " those of the Institute of International Law.

" If we look at it closely, however, we find that he was obliged " to attach some qualifications to these apparently satisfactory " conclusions. He said that the free association would be entirely " unofficial in character, but would nevertheless secure ' the indis- " ' soluble relations of the official statistics of the various States.' " That is a very excellent end, but how is it to be realised? The " influence of the individuals belonging to the Institute would " supply the needful pressure, according to Dr. Neumann-Spallart's " intention. He also thinks that the official statisticians who " belong to the Institute will influence their Governments. We " perceive with amazement the Permanent Commission, supposed " to be dead, rising, like Banquo's ghost, in our midst. Quite " apart from the fact that Germany has plainly stated her inten- " tion to hold aloof, and that in consequence only an incomplete " institute could be formed at the outset, we are obliged to ask " what will be the attitude of the official statistical authorities " towards the institute?

" We shall get an inkling of this if we examine the standpoint " which Hofrath von Inama-Sternegg had the courage to repre- " sent. He was the only person who really defined the position of " official statistics as it will have to be defined. And it is to be " observed that the antecedents of this gentleman secure him, as " it seems to us, against being considered a mere bureaucrat. He " alone permitted himself no allusions in the midst of the general " rejoicing, which some people were unwilling should be disturbed. " He proposed a resolution entirely approving the formation of " a free scientific institute in accordance with Dr. Neumann- " Spallart's address, but was of opinion that this institute, in " order to achieve practical results, should be kept so well " informed as to their views by the Governments and their " representatives that it was desirable to express to the latter a " wish that they should, by means of independent and purely " diplomatic conferences held from time to time, make known " their views and determine on forms of statistical organisations.

" The correct conclusion appears to us to be this: scientific " and official statistics have thus far rather hindered than helped " one another by their connection. They are now to separate. " The separation is to be effected not by ignoring official statistics, " but by permitting separate work and a separate form of organi- " sation (by means of the Institute and conferences) entirely " independent of one another, and thus rendering progress possible

"on both sides. Hofrath von Inama-Sternegg seems to us by far "the best advocate of the 'freedom' of the Institute. Only on "this plan is it possible to maintain this freedom intact and secure "the co-operation of the representatives of Germany."

The journal goes on to approve the opinion that no Government could bind itself to accept the decision of a majority of the Institute, as it would often depend on accidental circumstances of time and place. It then describes the proceedings by which the Institute was formed, and expresses a hope for its success, which it observes can only be attained by means of co-operation, without any *arrière-pensée*, with the official statistical authorities, and by including Germans.

Separat-abdruck aus den "Jahrbüchern für Nationalökonomie und Statistik" herausg. von PROFESSOR JOH. CONRAD. *Verlag von* GUSTAV FISCHER *in Jena. By* PROFESSOR VON NEUMANN-SPALLART.

THE following is a brief summary of an article from the above in relation to the foundation of the International Statistical Institute at the Jubilee Meeting:—

It is ten years since any opportunity has been afforded to statisticians of carrying on in regular form the personal intercourse and exchange of thought which were so beneficially fostered at the International Statistical Congress during the period from 1853 to 1876. One of the latest works of Adolf Quetelet was the "Statistique Internationale." It was therefore with all the greater satisfaction that the jubilee of the foundation of the two most important statistical societies of Europe was greeted by all who knew how to value the importance of these meetings to international statistics. The Statistical Society of London offered the most appropriate ground on which to revive the enterprise. It may be considered as an omen of happy import that Quetelet himself was dwelling in London at the time of the first exhibition, when it was proposed that the first statistical congress should be held in the following year. The idea of making the assembled delegates from every country the *point d'appui* for a permanent union was so much in touch with the spirit of the times that the Société de Statistique in Paris also contemplated the promotion of a permanent international union. The first form of the organisation might be that of a strictly official and authoritative character. With this object Dr. v. Inama-Sternegg, President of the Austrian Statistical Central Commission, proposed a resolution before the London meeting in June last. The second form of organisation might be that which an international statistical corporation would stamp with a semi-official character, such as Herr Keleti had in view. And thirdly and lastly, there is the principle of a public association, which it is true would lack any

official character, but which should nevertheless insist on the identical draughting of official statistics as indispensable. In order to make the scientific statist and the businesslike intentions of the association evident, I proposed to call it "L'Institut International de Statistique." The result of the deliberations of the committee specially appointed *ad hoc* was to make such commendable alterations in my original suggestion as to establish the purely scientific character of the new institution beyond any possible doubt. The committee proposed through Dr. Mouat the acceptance of the draught statutes, and at the afternoon session of the 24th June of this year of the Jubilee meeting the proposal was unanimously adopted, and the wording of the statutes was settled.

Separat-abdruck aus der "Statistischen Monatschrift," XI Jahrgang, VIII und IX Heft. Verlag von ALFRED HÖLDER, K.K. *Hof- und Universitäts-Buchhändler.* (*Vienna.*)

AN article in the above relating to the foundation, at the Jubilee meeting, of the International Statistical Institute, is briefly summarised as follows :—

The foundation of an international statistical institute was accomplished in June this year as the most noteworthy result of the respective Jubilees of the Statistical Society of Paris and the Statistical Society of London. Since the year 1878 statisticians have been obliged to forego the meetings of which promise had been held forth in the statistical congresses initiated by Quetelet in 1853. The establishment of an independent scientific institute of international statistics was already within measurable distance, and now acquires a definite status from the approbation expressed by Professor von Neumann-Spallart. On this basis the statutes of the new institution were framed in London, the institute founded, and a first convention of the existing members invited in advance to Rome. So far however only one side of the problem of international statistics has found a happy solution. The laboratories of statistics are still indisputably the official statistical departments. The various Governments will in time reconcile their interests by insisting decidedly upon fixing in principle a perfectly clear limit to the activity of the institute.

APPENDIX IV.

List of Papers Read before the Society and contained in the Journal from the commencement to the end of 1884.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

List of Papers Read before the Society—Contd.

STATISTICAL SOCIETY'S JUBILEE ACCOUNT.

Dr. *Cr.*

RECEIPTS.

	£	s.	d.	£	s.	d.
To Jubilee Fund	468	12	6			
„ Albert Palace Dinner	47	6	–			
„ Dinner Tickets (Criterion)	106	5	–			
„ Conversazione Tickets	54	12	6			
				676	16	–
„ Subscriptions unpaid—						
Jubilee Fund	6	17	–			
Albert Palace Dinner	1	7	–			
Dinner Tickets (Criterion) ...	1	5	–			
				9	9	–
				£686	5	–
„ Balance in Bank	55	7	–			
„ Subscriptions unpaid	9	9	–			
				64	16	–

PAYMENTS.

	£	s.	d.	£	s.	d.
By *Dinner* at Albert Palace				48	12	–
„ „ at Criterion				153	5	–
„ *Conversazione*—						
Hill and Son, Refreshments	160	9	–			
Herr Sauerthal, for Band.....	40	–	–			
Glee Club Expenses	2	2	–			
South Kensington Museum	35	10	–			
				238	1	–
„ *Meetings*—						
University of London ...	6	8	–			
Reed and Co., Shorthand Reporting	12	12	–			
Police at London University	–	15	–			
Mr. Barley, for Translations	17	–	–			
				36	15	
„ *Printing, Stationery and Advertising*—						
Harrison and Sons, Printing	39	13	6			
C. and E. Layton, Printing, &c.	17	13	–			
Street Bros., Advertising	22	9	3			
				79	15	
„ *Sundries*—						
Postage and Telegrams	21	–	–			
Salaries and Wages	28	1	8			
Irvine and Co., Writers..	13	4	–			
Cabs, &c.....	2	12	–			
Draft Stamp, as per bank book	–	2	1			
Commission on a Dublin Cheque	–	–	6			
				65		
				621		
„ Balance in Bank	55	7	–			
„ Subscriptions unpaid	9	9	–			
				64	16	
				£686	5	
„ Estimated Cost of Jubilee Volume...				£260	–	

Note.—The receipts and payments on account of the Jubilee Fund were kindly audited b Mr. J. O. Chadwick on 6th November, and the latter certified to be correct as stated above; but the forme have since been altered by payment of some of the subscriptions that were outstanding at that date.

HARRISON AND SONS, PRINTERS IN ORDINARY TO HER MAJESTY, ST. MARTIN'S LANE.